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AN ECONOMIC ANALYSIS OF MILITARY FAMILY
HOUSING: SHOULD THE GOVERNMENT CONTINUE TO
PRIVATIZE?

THESIS

Chad A. Woods, Captain, USAF

AFIT/GFA/ENV/09-M03

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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AFIT/GFA/ENV/09-M03

AN ECONOMIC ANALYSIS OF MILITARY FAMILY HOUSING: SHOULD THE
GOVERNMENT CONTINUE TO PRIVATIZE?

THESIS

Presented to the Faculty

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In Partial Fulfillment of the Requirements for the

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GOVERNMENT CONTINUE TO PRIVATIZE?

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Abstract

Providing military family housing has always been a difficult task for the United States government. To solve the latest housing short fall, the government signed the Military Housing Privatization Initiative (MHPI) into law in 1996. Under this program the government contracts private developers to build, own, and operate housing units. The developer then collects rent through housing allowance payments. At the time MHPI was signed into law, military members were expected to pay 15 percent of their housing costs out of pocket. Subsequent legislation has increased housing allowance to provide 100 percent of all housing costs eliminating out of pocket housing expense to the military member.

Given the increased housing allowance, the objective of this research was to determine if there is financial value to the government to retain ownership of family housing. This was done by calculating the Net Present Value (NPV) of recapitalizing BAH payments into family housing operations over 50 years, the contract period for privatized housing projects.

The results show that MHPI provided the greatest financial benefit to the government at the time it was signed into law. This advantage changed however, when housing allowance increased eliminating out of pocket housing expense to the member.

Acknowledgements

I would like to express my sincere appreciation to the members of my committee for their assistance as I progressed through this research; Maj Peachey for his leadership and guidance, Lt Col Kee for his motivation and encouragement, and Lt Col Fass for his insights and suggestions.

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Chad A. Woods

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AN ECONOMIC ANALYSIS OF MILITARY FAMILY HOUSING: SHOULD THE GOVERNMENT CONTINUE TO PRIVATIZE?

I. Introduction

Throughout the history of the United States, demands placed on fiscally constrained budgets have far exceeded the capacity to fulfill those demands resulting in increases to the national debt. There have only been a few years since 1962 that the government has generated more in tax revenue than Congress has spent. The following table reflects the budget activities and national debt increases since 1962:

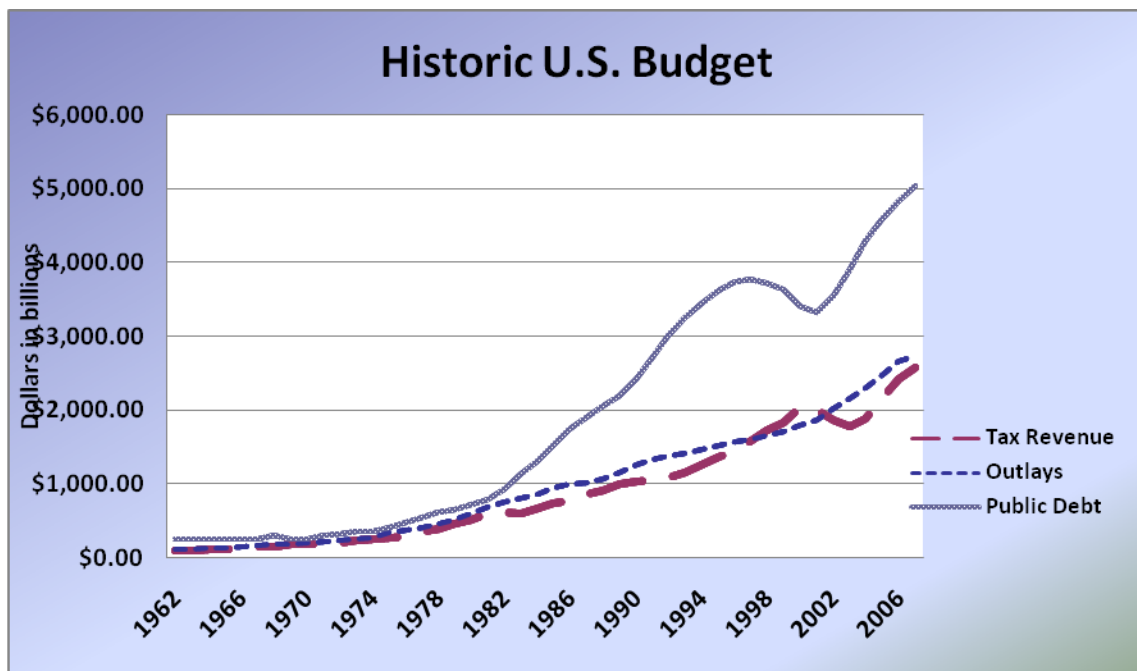


Figure 1, (CBO)

These budget surplus years represent times of rapid growth and reduced demands on the federal budget. The pattern of requiring more from the federal budget than is

collected in tax revenue has held true for most of U.S. history and is especially prevalent in today's economy. Therefore, it is important to make every dollar count in today's economic environment.

There are numerous examples of private companies that have invested large sums of money in various projects to later abandon these projects due to a change in circumstances that motivated the initial investment.

Likewise, DoD signed the Military Family Housing Privatization Initiative (MHPI) into law in 1996. This new initiative shifted ownership and operation of family housing to private developers. It was determined, at the time MHPI was signed, that private developers could provide the needed construction and renovation in a more efficient and cost effective manner than could traditional military construction (Milcon). At that time, military members were expected to pay 15 percent of their housing costs out of pocket. Subsequent legislation increased housing allowance to provide 100% of the cost needed to secure adequate housing.

Given the fact that the situation surrounding the creation of MHPI have changed, should the government continue to privatize or would there be value to the government to change course and retain ownership of family housing units?

There have been many attempts at finding efficiencies and cost saving techniques within the Department of Defense (DoD) to help ease the burden of financial constrained budgets, the latest being Air Force Smart Operations for the 21st Century (AFSO21). A similar cost saving program is known as Defense Management Review (DMR). Under this system, proposals for improvements are numbered and submitted to the appropriate office within the various services (Army, Air Force, Navy, Marines) for review. When a

review of a proposal is completed, a Defense Management Report Decision (DMRD) is prepared and forwarded to the head of the appropriate service agency for comment. After the comments from the service agencies are completed, the DMRD is forwarded to the Secretary of Defense (SECDEF) for a ruling on the implementation of the proposal (Ray 1991).

DMRD 966 was a cost saving proposal submitted in 1990 which suggested a shift in the method of financing and budgeting family housing operations and serves as the basis for this research. This shift would establish in-house funding for housing operations on an equivalent basis with the family housing allowance program as the collection of BAH payments would be the sole source of funding for family housing operations.

At the time DMRD 966 was submitted, several installations indicated the need for additional government housing due to inadequate housing in the local community. An investigation team, formed to research DMRD 966, found incoming personnel at those locations were being placed in adequate housing within two to five days which was deemed by the investigation team as satisfactory. The investigation team also suggested that competing government and private sector housing against each other would help determine whether or not adequate housing is available and whether or not additional government housing was needed (DMRD 966).

As stated in DMRD 966, numerous studies throughout the years have suggested that providing housing allowance to members is the most cost effective method of meeting DoD's housing requirements. The proposal also suggested that DoD should be able to fund family housing at the cost of the service member's allowance. The following

reasons were given, by the investigation team, as to why DoD should be able to accomplish this: the private sector charges in excess of their costs to make a profit; there are overhead business expenses in the private sector that the government does not have i.e. advertising, property taxes, insurance, and the cost of land for their projects (DMRD 966).

The traditional method of funding family housing operations, as well as various fiscal restrictions, prevents local installations from running DoD family housing in the most cost effective fashion. The following suggestions were given, by the investigation team, to create a more business management approach to family housing which would level the playing field between private sector housing and military housing:

1. Allow family housing managers to operate family housing operations like a business by giving them control of their staffing, purchasing, and increased contracting authority.
2. Make each service member a client who controls the purchase of services. To do this, service members would be allowed to use allowance funds provided under the current system either in the private sector or to rent on-base housing.
3. With the exception of military construction funds, which would be treated as capital investment items, all funding for family housing operations, maintenance, and improvements would be strictly based on allowance collected from service members who move on base. New military construction capital investments would be depreciated over their 40-year economic life, and the annual proportional cost of these investments deducted from the installations family housing operating budget. This would mean

local commanders would be buying the additional inventory assets and paying for them over time as is done in the private sector.

This shift would cause a significant impact on family housing operations. Decisions on appliance expenditures, maintenance procedures, repair or replace decisions, new construction, leases, staffing housing management offices, and a wide range of other decisions would be forced toward a strictly business approach. If sound investments were not made, repair projects would have to be canceled or employees would have to be laid off. Motivation for immediate corrective action would be provided to take care of situations like contractor abuses because a sense of ownership would be created. Commanders and housing managers would need to address items like employee to client ratios and support staff to the number of units' ratio. As stated previously, these considerations were typically not addressed in the traditional funding method. This shift would generate a similar climate to that which has proven successful in many housing ventures. With funding strictly dependent on customer satisfaction and sound business decisions, personal involvement would be automatic. These changes would create an atmosphere of true cost effectiveness that would dictate decisions. (DMRD 966).

An additional suggestion for improving family housing operations happened in 1995 when SECDEF William Perry commissioned the Defense Science Board Task Force to report on the quality of life in the military. The report featured a section on the poor state of DoD's military family housing assets and recommended the creation of a Defense-wide non-profit Military Housing Authority. The housing authority was never put into service (Twiss and Martin, 1998:64-65).

Research Objective

The objective of this research was to determine if there is value to the government by retaining ownership of family housing facilities. This was accomplished by determining the Net Present Value (NPV) of implementing DMRD 966 housing at bases that have not yet privatized. The size and scope of the proposed privatization projects, and the 2009 BAH rates were used for these calculations. To analyze the feasibility of implementing 966 housing in place of privatization at the time MHPI was signed into law, the 2009 BAH rates were reduced by fifteen percent representing the housing cost military members were expected to pay. The eight installations analyzed were selected as a representative sample of military installations across the United States.

Research Scope

The scope of this project was limited to the financial analysis of funding housing operations through the principles outlined in DMRD 966. Implementing these principles may violate budget policy and regulatory guidance; however these restrictions are beyond the scope of this research. There are also several issues associated with this research topic such as evaluating BAH rates for married and single personnel, privatizing dormitories for single personnel, historic housing on military installations, and General Officer quarters. These areas are beyond the scope of this research and will not be addressed in this thesis. Chapter two of this research includes a brief history of family housing, the origin and purpose of housing allowance, previous housing privatization attempts, and previous research on this topic. Chapter three explains the format and the

methodology of this research. It also defines the costs that were gathered for the analysis.

Chapter four discusses the findings. Chapter five identifies the conclusions, recommendations, limitations, and potential follow on research.

II. Literature Review

Introduction

To better understand the challenges of providing Military Family Housing (MFH) to those serving throughout the Department of Defense (DoD), a brief history of MFH, as well as housing allowance is presented in this chapter. Previous privatization initiatives, that attempted to change housing policy within DoD, and previous research on family housing is also included in this chapter together with RAND and GAO recommendations. A full understanding of these topics helped answered the question of the feasibility and efficiency of operating Military Family Housing as a business enterprise.

History of MFH

The Third Amendment of the United State Bill of Rights, introduced by James Madison on 5 September 1789, was signed into law on 15 December 1791. This amendment prohibited quartering soldiers during peace time in private homes without the owner's consent. This was done in an attempt to prevent the recurrence of the British quartering their soldiers in private homes during the Revolutionary War (Bragdon, McCutchen and Cole, 1973:139). Implementing the Third Amendment created an obligatory perception within the military services to provide housing for military members during peace time (Baldwin, 1993:1).

Prior to signing this amendment, the military set a precedent for providing shelter for a few of its members. Historians discovered this precedent be an Act signed in 1782

which authorized a Major General and his family one four horse covered wagon and one two horse wagon (Yancy, 1991). At the time this Act was signed, only the most senior ranking officers were authorized these allowances because they were the only members permitted to bring their families when they moved (Milican 1983:4).

The size of the military in early United States (U.S.) history, especially prior to the twentieth century, was relatively small. The majority of the force was made up of single unaccompanied males in the enlisted ranks (Baldwin, 1993; CBO 1993; OASDP&R, 1993). There was an expectation for these men to remain single and to live in the barracks or aboard ships (Defense Science Board, 1995). During the nineteenth century, military family members would gather in port cities or near frontier posts (Baldwin, 1993:1).

In an attempt to fortify coastal regions, construction began in 1794 which consisted mainly of earthen and wooden structures. Eventually permanent structures like Fort McHenry and Fort Mifflin were built in response to a growing threat of war. It was the war of 1812 as well as the British burning our nation's capitol that reinforced the need to construct fortifications to protect against invasions (Baldwin, 1993:2). Military construction continued after the war of 1812 as additional coastal regions were fortified. Additionally, frontier posts were developed to protect against Indian attacks, as the U.S. developed westward (Baldwin, 1993:2).

As these permanent military installations were constructed, there was no requirement to provide anything more than basic housing (Baldwin, 1993:2). The rules were simple; lieutenants received two rooms, captains received three rooms, majors four rooms etc. This rule worked well until the number of military personnel began to

increase at newly developed installations. When subsequent personnel arrived, they were forced to find housing in the local community and wait for an opening at the fort. This was the introduction of the military housing waiting list (Milican, 1983:4).

Congressional appropriations were insufficient to construct adequate quarters for officers and barracks for enlisted members. In addition, inadequate funding prevented necessary maintenance which meant that the facilities that were constructed continued to deteriorate (Baldwin, 1993:2). Baldwin explains that the coastal facilities were bad but the western frontier was even worse.

The soldiers provided the labor for building the defenses and their living quarters. Often these frontier posts were primitive, unsanitary, and prone to rapid deterioration. If living facilities for officers and soldiers were rudimentary, those for the soldier's families were wretched. Abandoned barracks, old stables, or shanties often served as family housing. Poor housing in the West and along the coast led an 1870 Surgeon General's report to assert that the United States has the best-fed and worst-housed Army in the world (Baldwin, 1993:2-3).

The first major peace time building campaign happened between 1890 and WWI. In addition to focusing on housing during this boom in construction at the turn of the century, focus was also given on military communities. These communities became small towns with stores, schools, libraries, and gyms (Twiss and Martin, 1998:3; Baldwin, 1993:3). The emphasis on improved living conditions for the military coincided with a decline in the desertion rate. These events happened not long after

General William T. Sherman contended that it was time that the country treats “the soldier as a fellow man” (Baldwin, 1993:3).

The family housing needs of military officers was first recognized in 1918 by a temporary war measure. However, no attention was given to the needs of enlisted family housing (Twiss and Martin, 1998: 5 Segal, OASDP&R, 1993). Access to family housing was given to those who had paid their dues and demonstrated their commitment to a military career (Hartman & Drayer, 1990).

Due to declining personnel and defense appropriations after WWI, the Secretary of War limited housing expenditures to necessary repairs and temporary construction only. New construction was prohibited. This led to a dependence on temporary facilities constructed during the war which deteriorated rapidly due to lack of maintenance. This was happening at the same time the civilian sector was experiencing a major housing construction boom (Baldwin, 1993:5).

The Chief of Staff of the Army, in 1927, embarrassed the Coolidge Administration by explaining the disgraceful conditions of Army housing. National magazines published articles titled “Our Homeless Army” and “Army Housing: A National Disgrace.” This led to the second major peacetime housing construction as congress and the Coolidge administration approved more money for housing (Baldwin, 1993:5).

Military housing projects were included in President Hoover’s attempt to boost the economy during the Great Depression. President Roosevelt continued this direction as he attempted to create jobs and to spur the economy (Baldwin, 1993).

WWII brought new demands for military family housing and a need to increase the quality of life in order to retain career personnel. In 1949, the Career Compensation System made public quarters available to career enlisted members. Personnel in the grades E-1 through E-4 with less than seven years of service were still required to live in barracks or aboard ships. These members continued to be treated as if they should not have family members (Twiss and Martin, 1998:10).

After WWII, the military realized it needed to maintain a larger force than it previously had in order to support the cold war. After the demobilization of millions of soldiers at the end of the war, the size of the Army was still at least seven times larger than the Army of the thirties (Baldwin, 1996). Adding to the housing shortage problem was the ever increasing percentage of married personnel, from 35% to 45% in the 1950s. In 1953, one third of the enlisted force consisted of married households (Twiss and Martin, 1998:11). The third surge in military housing and the largest and most productive period of military family housing occurred during the late 1940s, 1950s, and 1960s. The new housing expansion took place under two privatization initiatives: the Wherry housing program followed by its replacement the Capehart housing program. These two programs produced approximately 200,000 housing units which make up a large portion of our housing inventory today (Twiss and Martin, 1998:15; CBO, 1993:3). Additional information on the Wherry and Capehart programs will be addressed later in the chapter.

With the Wherry and Capehart housing programs ending in 1962, the construction and maintenance of all base military family housing was returned to the military and was to be funded through military appropriations (Twiss and Martin, 1998:17).

Throughout the Kennedy, Johnson, and Nixon administrations, the government constructed approximately 8,000 new family units per year. This took place during the 1960s and early 1970s (Twiss and Martin, 1998:18-19).

On 1 July 1973, the all volunteer military force was created. This required more services and benefits to soldiers and their families. The reduced personnel strength following the Vietnam War eased some pressure on housing availability but was not enough to induce enlistment or reenlistment. Additionally, the percentage of married personnel continued to increase. In response to the demand for better family housing, Congress authorized construction of more than 12,000 units per year from 1973 to 1975, which represented the fourth surge in increased quality and inventory of military family housing (Baldwin 1993:12). By the close of the 1970s, rapid inflation, increasing fuel costs, and new budget priorities of the Carter presidency resulted in fewer construction dollars and the construction rate was significantly reduced (Twiss and Martin, 1998:18; Defense Science Board, 1995:62).

By the early 1980s, 80 percent of the officer and enlisted career force, and 28 percent of first-term enlisted members were married (Baldwin 1993:14). Due to the possibility of project abandonment, Congress was cautious about military construction because closure and realignment discussions were carried over from the 1970s (Twiss and Martin 1998:41). The construction that did take place, using the Reagan era defense spending, increased focused on providing housing for junior career members in grades E-4 through E-6. This was the fifth era of housing growth in the history of the military (Twiss and martin, 1998:47; Baldwin, 1993:15)

While increases in construction of adequate housing occurred, the 1980s housing program was expensive and began to decline with defense budgets toward the end of the decade (Baldwin, 1993:16).

Although quality of life initiatives during the 1990s enabled junior enlisted members' access to on-base military family housing, a large portion of the inventory was old and needed significant repair or replacement (Twiss and Martin, 1998)

In 1995, Secretary of Defense (SECDEF) William Perry commissioned the Defense Science Board Task Force to report on the Quality of Life in the military. The report featured a section on the poor state of DoD's military family housing assets and recommended the creation of a DoD wide non-profit Military Housing Authority. The housing authority was not put into service (Twiss and Martin, 1998:64-65).

In response to increasing maintenance and repair costs with an inadequate budget, Congress authorized the Military Housing Privatization Initiative (MHPI) under the National Defense Authorization Act of 1996. This enabled DoD to work with the private sector to build and renovate military housing.

History of housing allowance

During the war of 1812, the Army increased its personnel strength from 6,686 men in 1812 to 19,036 men in 1813. Although a significant increase, it fell short of the Army's goals. It was at this time that the allowance for quarters was introduced by the military. The Army used this new authorization as a recruitment tool in order to achieve

and sustain a larger Army. This incentive was successful as the Army was able to sustain 27,000 men until the Civil War (Hoffman, 1991).

In 1872, the Basic Allowance for Quarters Act was passed which provided five dollars a month per room to any officer who was unable to get military housing. Enlisted personnel were not included in the Act. This Act is significant because it set a precedent that the military will provide either housing or money in kind (Ray, 1991).

In 1916, Congress passed an appropriation which provided \$2M to support the families of enlisted personnel who were recruited or drafted. The purpose of this appropriation was to compensate military members for lost pay as a result of entering the military up to \$50 per month (Hoffman, 1991). This system of providing variable housing allowance ended in 1935 because the Senate Subcommittee for Pay and Allowances for Fiscal Year 1936 considered the uncapped rates too expensive. The Committee applied a ceiling to the allowance of \$20 per month regardless of local housing prices and did not include utility expenses. The transfer from the variable rate to the fixed rate was the end of market responsive allowance until the introduction of variable housing allowance in 1980 (Hoffman, 1991).

The current system of base pay plus allowances was established in the Joint Service Pay Act of 1922. Under this Act, officers and warrant officers would receive an allowance for quarters, based on grade and dependent status, when government quarters were not provided (Baldwin, 1993:5). This Act was created in part to respond to increased desertion rates, and lower recruitment and reenlistment rates blamed on low pay and poor living conditions (Baldwin, 1993:5).

Enlisted members were not authorized housing allowance in the Pay Act of 1922. The Act actually reduced pay of enlisted members and “the Army assumed that these personnel were single and therefore not entitled to allowances for dependents”. The Army responded to the decline in enlisted living conditions by discharging enlisted members who married without permission. This act continued through the summer of 1939 (Baldwin, 1993:5)

In 1940, senior enlisted member were authorized cash substitutes if no quarters were available (Twiss and Martin, 1998:10). Following WWII, the 1949 Career Compensation Act offered “career soldiers” with at least seven years of service basic allowance for quarters (BAQ) when government housing was not available. Enlisted members in the grades of E-4 and below, with less than seven years of service, were considered to be without dependents and were not entitled to BAQ (Baldwin, 1993:7).

In 1962, the Secretary of Defense Robert S. McNamara “acknowledged as official DoD policy what had been the de facto situation, reliance upon the private sector to accommodate most military families” (Baldwin, 1993:10; Twiss and Martin, 1998:10). Secretary McNamara centralized the management and funding of family housing across the services in the Office of the Secretary of Defense (Twiss and Martin, 1998:10). He also pursued another policy change concerning off-base housing for African American personnel. Members of the military were forbidden from renting or leasing any housing from landlords who discriminated (Baldwin, 1993:11). The military was very successful in desegregating housing according to a study on the impact of these anti-discrimination policies on civilian housing (Twiss and Martin, 1998:18; Hershfield, 1985:23).

In the 1970s, military members living on the economy were the most adversely affected by the unparalleled inflation, slow growth, and high unemployment rates. The term stagflation was coined to describe the economic situation. Stagflation resulted from the fuel crisis and soaring utility costs of the 70s. Members living in government quarters did not pay for utilities; therefore these members were not as adversely affected (Twiss and Martin, 1998:25). Studies began on variable housing allowance to help offset the cost discrepancies suffered by those living off base in different parts of the county (Twiss and Martin, 1998:34).

Because housing construction was significantly reduced during the 1980s, housing allowance became a growing concern. Representatives from the DoD recognized two recurring problems: access to reasonably priced housing in high-cost areas was dwindling and private industry was not producing affordable housing sufficient for junior enlisted members in high-cost areas. (Twiss and Martin, 1998:48-49)

President Carter signed the Military Personnel and Compensation Amendments which established the Variable Housing Allowance (VHA) in 1980. This was done to help offset living expenses in high cost of living areas (Twiss and Martin, 1998:50).

VHA was initially used whenever military costs exceeded 115% of the members BAQ. At the time, BAQ covered approximately 65% of the median military cost of housing on the economy. “The original goal of VHA was to limit out of pocket living expenses to no more than 15% of the median military housing costs” (Twiss and Martin: 1998:50).

Median military housing costs were calculated as actual costs incurred by military members of similar rank and dependency status by location as opposed to the median

monthly costs of housing by location. These calculations lead to insufficient allowances. Military members may “rent down” in high cost areas meaning to accept inadequate housing in an attempt to maximize their allowance. Alternatively, members may rent up in low cost areas accepting higher quality housing than they may otherwise accept. Basing housing rates on actual expenses would inflate low cost areas and deflate high cost areas. The percentage of out of pocket housing costs rose from 10% in 1981 to 20% by the early 1990s because BAQ did not keep pace with housing costs (Twiss and Martin, 1998:50).

DoD continued to focus on the local communities to provide housing for military families during the 1990s. In the mid nineties, approximately 70% of military families stationed at stateside assignments were living in private off base housing (Twiss and Martin, 1998:63).

Even though the intent of BAQ and VHA was to limit the military member’s out of pocket housing expense to 15%, that ratio increased to approximately 20% during calendar year 1998 (Kokocha, 2001).

On 18 November 1997, President Clinton signed the 1998 National Defense Authorization Act that created a single basic allowance for housing (BAH) to replace the BAQ and VHA system (NDAA, 1997).

BAH is based on current market rental data, average utilities, and renters insurance; therefore it reflects the current rental market conditions, not the historical expenses incurred by the member. The out of pocket expenses incurred by the member may be greater or lower than the average depending on housing choice. Additionally, if a

military member chooses less expensive housing, he/she does not have to forfeit the unused portion of their housing allowance (DTIC, 2008).

The BAH initiative was a quality of life enhancement and offered significant improvements over the BAQ and VHA system. The table in appendix A explains these differences (DTIC, 2009).

In 2002 President Bush signed the 2002 Defense Appropriations Act. This legislation cut out of pocket housing expense to 11.3% and was intended to eliminate out of pocket expense entirely by 2005.

Previous Defense Management Report Decisions

In October 1989, the Department of Defense considered DMRD #910 which proposed a transfer of DoD Family Housing to the Private Sector. The intent of this initiative was to provide better equity in the distribution and use of housing allowances by military families, provide more efficient and cost effective maintenance of family housing units, and finally releases ownership, and the responsibilities of DoD housing. It was believed that these efforts would provide service members with better housing at substantially less cost to the government. DMRD 910 provided three detailed alternatives as a means of meeting these objectives:

1. Provide all military families with cash allowances for housing and charge market rents for DoD family housing which would provide a savings of \$506 million in FY 1991 dollars.

2. Contract out the operation and maintenance of DoD housing saving \$60 million and reducing civilian end strength by 2,547 in FY 1991.
3. Sell or permanently lease DoD housing, providing revenues of \$3,200 million and reducing civilian end strength by 2,037 in FY 1991 (Ray, 1991).

Under Provision One, DoD retained ownership of the housing units and charged rent to the occupants based on market rates. At that time, it was estimated that current market rates were 21% more than housing allowances. It was assumed in the initiative that military members were willing to pay the extra out of pocket expense for the security and proximity of living on base (Ray, 1991).

Provision Three removed the DoD out of the military family housing business altogether. Members would receive their appropriate allowances and rent government quarters from a private management group (Ray, 1991).

The Service Secretaries did not respond well to DMRD #910 and formal replies were sent to the SECDEF outlining adverse impacts of all three alternatives (Ray, 1991).

The Secretary of the Air Force pointed out that government quarters would need to be brought up to market condition before market rents could be charged. These costs would negate the identified savings. The Secretary of the Navy stated that the alternative would reverse 200 years of traditional benefits by breaking faith with the military member and would produce “a severe and immediate decline in the quality of life and morale of personnel residing with their families in government housing”. The Secretary of the Army stated that although the alternatives have some financial merit “it would be unconscionable to fund these savings out of families’ pockets when they are already financially burdened by a transient lifestyle” (Ray, 1991).

DMDR 910 was not approved but the concepts of the initiative were reworked based on the comments of the Service Secretaries which lead to the creation of DMRD #966. Focusing on the comments of the Secretary of the Army, initiative #966 took the financial burden off the member and placed it on the services (Ray, 1991)

Under DMRD 966, the military member would experience very little change in the operation or cost of living while residing in government quarters. The change within this initiative focused on the funding philosophy which was that each installation's MFH program be funded through allowances forfeited by their occupants (DMRD #966, 1990:1). DMRD 966 was not approved, however, the concepts it embraced were reflected in DMRD 971 (Ray, 1991).

DMDR 971 developed the concept of the Defense Business Operating Fund (DBOF). The DBOF is patterned after the existing concept of industrial funds, in which funds used to provide a particular service are based on the cost of that service to the user. The initiative states that funds generated by charging for a particular service should provide adequate income to maintain that service at a level acceptable to its customers (Ray, 1991).

Previous attempts at privatization

As mentioned earlier in the chapter, the military faced an unprecedented housing shortage following World War II. The two initiatives designed to alleviate this problem were Wherry housing followed by Capehart housing. In the 1980s, section 801 and 802 housing was introduced. Although various smaller forms of privatization were

introduced by the Department of Defense, this chapter will only address the initiatives previously mentioned.

Wherry Housing

Senator Kenneth S. Wherry from Nebraska introduced legislation that established a housing program that was named the Wherry program. The motivation for Senator Wherry's interest in Military Family Housing came after the closure of more than twenty Air Force Bases in Nebraska following WWII. The last Air Force Base to be closed in Nebraska, Kearney AFB, was closed primarily due to the lack of adequate family housing (Baldwin, 1996).

Under the Wherry program, independent developers were able obtain money through loans to develop a project. Developers would build, operate, and maintain the housing units specified by the military service. To keep costs low, projects were built on land leased for a nominal fee to the developer by the DOD for a period of not less than 50 years with some leases extending to 75 years. Some projects however were built on private property near the installation (Baldwin, 1996).

Although housing units were built on government land, Wherry housing was not considered government quarters. Private developers had to give priority to service members wanting to live in the units but the units were primarily rental housing. Military members chose voluntarily to live in Wherry housing and would pay rent to the developer from their housing allowance. Rental rates for these units were not determined by housing allowance. The Federal Housing Administration (FHA) established rental schedules for these units based on estimates the developer would need to operate and

maintain the housing, repay the mortgage, and make a profit. The mortgage was scheduled to be paid off in slightly less than 33 years (Baldwin, 1996).

The original bill for the Wherry program allowed mortgages to cover 100 percent of the construction costs. This percentage was reduced to 90 percent to ensure that developers had at least a 10 percent equity position in the development. The purpose of this reduction was to provide incentive for efficient operation and maintenance of the housing project (Baldwin, 1996).

The maximum amount of mortgage per unit under the Wherry program was capped at \$8,900. This meant that after the developer invested 10 percent into the project, the average per unit cost could not exceed \$9,000. Federal housing officials were concerned that the rents required for Wherry housing would exceed the low housing allowance of junior military members. Supporters of the bill responded with the proposal of steering senior ranking personnel with larger housing allowances to Wherry housing and reserving government quarters for junior personnel (Baldwin, 1996).

The Wherry housing bill was signed into law on 8 August 1949 by President Truman. DoD did not consider this program to be a complete solution to the housing crises, and preferred housing built with military construction funds. Although the Wherry program provided almost all the housing received by the military for six years following the approval of the bill, problems with the Wherry program quickly arose (Baldwin, 1996).

In the original regulations governing Wherry housing, the services were not authorized to hire architect-engineer companies to create detailed plans and specifications for projects. The request for proposal was limited to the number of units and general

guidelines on the size of the units and the rental rates. Private developers had to create their own plans and rental rates which resulted in a wide range of proposals that were difficult to compare. Some proposals were accepted by the military that were later rejected by the FHA because the plans failed to meet requirements (Baldwin, 1996).

Within the first few months of the Wherry program, it was discovered that developers were calculating their bids to limit the average per unit cost to the maximum mortgage amount \$8,100. This eliminated the need for the developer to invest personal funds into the project. In May 1950, Congress approved the authorization to hire architect-engineer firms to create plans for developers to bid on (Baldwin, 1996).

As the post WWII housing boom continued into the 1950s, housing construction costs climbed. The \$9,000 cap on the average per unit cost of the Wherry program soon became less adequate. In response, Congress increased the mortgage amount to \$9,000 which meant the average per unit cost, after private investment, increased to \$10,000. However, this increase in mortgage limits did not change the developers' intent to build the housing units for the mortgage amount, eliminating personal investment. Rumors of housing fraud became a scandal in 1954. According to congressional investigators, builders and corrupt FHA officials reaped enormous profits at tax payer's expense. The program officially ended in 1955 but few Wherry projects started after 2 August 1954 (Baldwin, 1996).

In an attempt to correct the problems of the Wherry program, the Senate Banking and Currency Committee began hearings for a new housing initiative in the spring of 1955. This new initiative was named after Senator Homer E. Capehart of Indiana.

Capehart Housing

Under the Capehart housing initiative, contractors would borrow 100% of the funds needed to build the housing project amortized over 25 years. The average cost per unit could not exceed the FHA estimated replacement cost of \$13,500 per unit which was an increase from the Wherry housing per unit limit of \$9,000. Architects and engineer firms were retained to design the projects. If the FHA disagreed with the SECDEF's decision to initiate a housing project at an installation, the DoD was required to provide mortgage insurance to fund against loss. After the housing was built, the government assumed the mortgage, took ownership of the assets, and assumed the responsibility for all the maintenance. After the government took possession of the project, the housing became government quarters. Families would then forfeit housing allowance in exchange for occupancy. The government would then use the forfeited housing allowance to pay off the mortgage. Operation and maintenance of the units were funded through appropriated funds (Baldwin, 1996).

Senator Capehart explained before the Senate Banking and Currency Committee that this program would be cheaper than building housing with appropriated funds. He was quoted as saying "by this method it will cost the government nothing, because the mortgage is amortized and paid from the rents that the men in the service will pay." Senator Capehart was also quoted as stating "It's just a question of whether you want to sell bonds to build houses or whether you want to sell mortgages to build them." The role FHA would play in Capehart housing soon came into question. One commissioner testified "we do not believe that it is necessary for the FHA to insure mortgages guaranteed by the Department of Defense." While the FHA did estimate the

replacement cost of the projects and could disagree with the SECDEF's opinion about the need for additional housing, the FHA would play less of an important role in the Capehart program than it had in the Wherry program (Baldwin, 1996).

Even though the Department of Defense preferred to build housing with appropriated funds, they were willing to accept any program to help them alleviate the housing crisis. DoD acknowledged that Wherry housing was too small and with the increased average per unit cost limit, Capehart housing would be an improvement. The Capehart program was signed into law on 11 August 1955 (Baldwin, 1996).

Every bid received by the DoD for the first housing project under the Capehart program came in slightly over the FHA replacement cost limit. Therefore, the FHA had to revise this limit to award the project to the lowest bidder. On the second project, every bid came in significantly above the replacement cost limit. The FHA was unwilling to revise this limit, so the project was canceled. The housing Act of 1956, which was signed into law on 7 August 1956, increased the average per unit replacement cost from \$13,500 to \$16,500. This new law also placed the same restrictions on housing size that was imposed on housing built with appropriated funds: 1,080 square feet for junior enlisted personnel and up to 2,100 square feet for general officers. The Housing Act of 1956 allowed the Capehart program to run smoothly for several years as all bids came in under the replacement cost limit (Baldwin, 1996).

Problems with maintaining two housing initiatives

Just as it seemed the military had found a way out of the housing crisis, new problems emerged. Owners of Wherry housing started lobbying against the Capehart bill. Since the average per unit limit of Capehart housing was between 50 and 85 percent more than Wherry housing, Wherry owners argued that military members would prefer to live in Capehart housing. Also, commanders preferred Capehart housing because they maintained control of it. Commanders would fill Capehart housing first causing significant vacancies within Wherry housing. The initial premise for the Wherry bill was that the project would experience no more than a five percent vacancy rate. Later expectations reduced the vacancy rate to three percent. Wherry owners argued that a vacancy rate greater than five percent would cost them money. In 1956, 17 percent of Wherry owners had vacancy rates above five percent. As additional Capehart housing was built, Wherry vacancy rates continued to climb (Baldwin, 1996).

The Capehart bill included a provision for the SECDEF to acquire Wherry projects at fair market value; however, when Wherry owners tried to sell, the government opted not to buy. The Supreme Court also ruled, in 1956, to allow local governments to tax Wherry projects. Raising rents to cover this new tax was not an option, as doing so would make Wherry housing less attractive and increase vacancy rates even higher. The Senate banking and Currency Committee included a provision in the law requiring DoD to purchase Wherry projects. Instead of paying fair market value however, a formula price was prescribed which resulted in less than fair market value. Sponsors of the Wherry project concluded that “if a mistake has been made in the program, it was the

turning of ownership, operation and management of military housing over the private industry; the military and private enterprise are not compatible in the field of ownership and management of military housing” (House Committee, 1959). The DoD argued that by some measure the Wherry program was a success. Although the housing was small, 831 net square feet, they were not expensive and provided some badly needed housing to the military (Baldwin, 1996).

By the early 1960s, the DoD obtained approximately 151,000 Capehart housing units. It appeared for a time that the Capehart program was the permanent solution for providing military family housing. It wasn’t long before varying assumptions surfaced and disagreements within Congress arose as to which method was most cost effective, Capehart housing or appropriated fund housing. The GAO also criticized Capehart housing claiming that the services overestimated their housing requirement and were building too many units. The GAO also argued that unnecessary items, such as dishwashers and air conditioners, were being purchased (Baldwin, 1996).

In addition to the problems already faced by the Capehart program, financial problems emerged in the spring of 1960 and the FHA increased the interest rate from 4.25 percent to 4.5 percent, the maximum statutory amount. With the tight market, lenders required discount points of six points or more. This made it difficult for the DoD to receive bids under the \$16,500 average per unit limit. The limit was increased to \$19,800 in June of 1960 (Baldwin, 1996).

The biggest blow to the Capehart housing program happened in the spring of 1960 when it was discovered that a California developer stopped paying his subcontractors which resulted in liens being placed on the project. Neither DoD nor FHA

had adequate procedures for dealing with the resulting legal problems. The program was attacked during a debate on the military construction authorization bill on the floor of the Senate in May 1961. Senator Russell was quoted as saying “the Capehart program deludes people with the idea that we will not have to pay for the housing, because it postpones it all into the future.” The Senate voted not to renew the program beyond 1961 and to build family housing using appropriated funds (Baldwin, 1996).

Both Senator Wherry and Capehart conceded that building housing with appropriated funds would be best, but both argued that the DoD could not maintain a long-term program of housing construction because of the many demands on its resources. The 1960s proved them right. The first post-Capehart appropriated housing program was drastically reduced before it left Congress. A few years later, the war in Southeast Asia pushed housing to a low priority (Baldwin, 1996).

Previous research

Three theses have been completed on military family housing. Two of these theses examined the feasibility of implementing the shift in funding family housing operations to funds collected from military members’ housing allowances. The third thesis examined all three housing alternatives: MILCON housing, privatization, and off base housing to determine which alternative provides the best value to the government and the American tax payer.

Ray (1991) was the first thesis that studied the feasibility of applying the shift in funding principle at Langley Air Force Base (AFB), Virginia. The results of his study

indicated shifting the funding policy would provide enough revenue to maintain the operation and maintenance of the housing units at Langley AFB with a \$689.0K annual surplus in 1991 dollars. One limitation identified in the study was the research failed to determine if enough revenue would be generated to recapitalize the inventory (Ray, 1991).

Shassberger (1994) was the second thesis that studied the feasibility of the funding shift at the La Mesa housing program at the Naval Post Graduate School in Monterey, California. Shassberger used an implied value of rental rates to compensate for the out of pocket expense service members were expected to incur at the time of his study. Shassberger's study found that using the implied rental rate would generate enough revenue to sustain the La Mesa housing program including recapitalization. Shassberger also reported the shift would produce a net loss to the government as the increase in the military personnel appropriation required, to give every military member housing allowance, would exceed the savings associated with the decreased military construction appropriation (Shassberger, 1994).

Although both studies found that it was possible to operate family housing using only the funds collected through housing allowance, they both focused on one installation or housing project limiting generalizability.

Kokocha (2002) evaluated public and private sector housing to determine which housing alternative would provide the best value to the government and to the American tax payer. Both qualitative and quantitative analysis was used to evaluate the three housing alternatives: MILCON housing, privatization, and off base housing at Robins AFB, Georgia. The results of this study revealed providing housing allowance for off-

base housing resulted in the greatest value to the government followed closely by privatization. MILCON housing was a distant third providing the least amount of value according to this study.

Using guidance provided by Secretary of the Air Force Financial Management and Comptroller (SAF/FMC), a benefit analysis model, which calculates values to the military member as well as values to the Air Force, was used to derive a total benefit value for each housing alternative (Table 1). Each benefit was assigned a weighted point value according to its relative importance: one for somewhat important to five for very important. Objective scores ranging from zero percent (does not achieve objective) to 100 percent (completely achieve objective) were assigned (Kokocha, 2002).

It is easy to see, given values from the benefit matrix in Table 1, that housing privatization yields the greatest benefit. However, the range for weighted point values was intended to range from one to five with five being the most important. The Air Force placed a weighting of 10 for timeliness which was twice the maximum limit. In addition, the timeliness objective score for MILCON housing, under Air Force benefits category, was rated at 25%. The explanation given for this low objective score was the fact that it took on average 24.5 days to complete one housing unit using MILCON construction and only 1.25 days under privatization (Kokocha, 2002).

Under the military members benefit category, affordability was rated 100% for MILCON construction, 95% for privatization, and 85% for off-base housing (Table 1). At the time this analysis was completed, military members were expected to pay 15% of their housing costs. Since then, housing allowance has been increased to cover 100% all housing costs. Regardless of the housing option the member chooses, the affordability

objective score should reflect 100% for all housing alternatives due to the elimination of the expectation for military member to pay a portion of their housing costs. The following table reflects the weighted point values and objective scores used to determine privatization yielded the greatest benefit:

Table 1 Benefit Matrix (Ray, 2002)

Benefits	Weighted point value	MILCON Objective Score	Privatized Objective Score	Off-Base Objective Score	MILCON Benefit Score	Privatized Benefit Score	Off-Base Benefit Score
Military Member Benefits							
Affordability	5	100%	95%	85%	5	4.75	4.25
Security	5	100%	75%	33%	5	3.75	1.65
Access to Quality Schools	5	100%	75%	75%	5	3.75	3.75
Health Safety	5	100%	100%	100%	5	5	5
Commute to Work	5	100%	90%	75%	5	4.5	3.75
Access to Main Base Facilities	5	100%	90%	75%	5	4.5	3.75
Privacy	5	50%	75%	100%	2.5	3.75	5
Air Force Benefits							
Timeliness	10	25%	75%	100%	2.5	7.5	10
Control Over Projects	5	100%	95%	75%	5	4.75	3.75
					40	42.25	40.9

Adjusting the affordability objective score to 100% for all categories and realigning the timeliness range to the maximum value of five results in the same benefit score (38.5) for both MILCON and privatized housing. It could be argued that the timeliness issue could be a product of contract execution. Any measure taken to reduce the average amount of time to build one housing unit will increase the timeliness objective score. Any increase in the timeliness objective score above 25% will yield a greater total benefit score for MILCON than is created for either of the two housing

alternatives. These changes are reflected in the table 2 and illustrate the increased benefit score for MILCON housing:

Table 2 Revised Benefit Matrix

Benefits	Weighted point value	MILCON Objective Score	Privatized Objective Score	Off-Base Objective Score	MILCON Benefit Score	Privatized Benefit Score	Off-Base Benefit Score
Military Member Benefits							
Affordability	5	100%	100%	100%	5	5	5
Security	5	100%	75%	33%	5	3.75	1.65
Access to Quality Schools	5	100%	75%	75%	5	3.75	3.75
Health Safety	5	100%	100%	100%	5	5	5
Commute to Work	5	100%	90%	75%	5	4.5	3.75
Access to Main Base Facilities	5	100%	90%	75%	5	4.5	3.75
Privacy	5	50%	75%	100%	2.5	3.75	5
Air Force Benefits							
Timeliness	5	26%	75%	100%	1.3	3.75	5
Control Over Projects	5	100%	95%	75%	5	4.75	3.75
					38.8	38.75	36.65

Annual costs to build and operate each of the housing alternatives were then summed. The following three tables illustrate the annual costs Kokocha (2002) used in his analysis:

Table 3 - MILCON Housing (Kokocha, 2002)

Amortized Costs of Capital for Construction per Unit/Per Year	\$4,942
Impact aid, for local schools, per unit/per year	\$620
O&M including utilities for 807 units per unit/per year	\$9,389
Total per unit per year	\$14,951

Table 4 - Privatized Housing (Kokocha, 2002)

(Scope of project = \$56.5 million for 370 new units, 300 renovated units)

Present value of credit subsidy for first mortgage loan guarantee = \$1,524,390 / 50 years/ 670 units	\$46
Present value of direct loan = \$11,280,488 / 50 years / 670 units	\$337
Conveyed land 270 acres (property value was excluded) = \$2,961,962 / 50 years / 670 units	\$88
Consultant Contract Costs = \$2,000,000/ 670 units / 30 year life of the project	\$100
Title II Services Costs (Construction management, site inspection, submittal review, etc.) = \$500,000 / 670 units / 30 year project life	\$25
BAH stipend, average weighted yearly cost per unit in BAH payments for 670 units	\$9,968
Military Family Housing Office Support associated with privatization	\$52
Total Cost for privatization per unit per year	\$10,616

Table 5 - Local Community Housing (Kokocha, 2002)

Average yearly BAH payments made at Robins AFB in 2001	\$10,048
Costs of paying contractors to deriving BAH rates per person / year	\$.068
Costs for military family housing support per person / year	\$12.5
Total costs for local community housing	\$10,061

A cost benefit value was then derived by dividing the total annual costs (Tables 3 to 5) by the total benefit score for each housing alternative (Table 1). Lower cost benefit ratings represent greater value to the government. Table 6 illustrates the cost benefit values for each housing alternative used in Kokocha's thesis and clearly identifies off-

base housing as providing the greatest value to the government followed closely by privatization:

Table 6 - Cost/Benefit Results (Kokocha, 2002)

MILCON - \$14,951 (total annual costs, table 3)/40 (benefit score, table 1)	374
Privatization - \$10,616 (total annual costs, table 4)/42.25 (benefit score, table 1)	251
Off-Base Housing - \$10,061 (total annual costs, table 5)/40.9 (benefit score, table 1)	246

The following three discrepancies, pertaining to costs used to calculate the cost benefit value, were found in Kokocha's thesis. This value was used to identify the housing alternative that provided the greatest value to the government. If these discrepancies were corrected and the principles outlined in DMRD 966 were implemented, would the result still show that off base housing and privatized housing provided the greatest benefit to the government?

1. The conveyed land value, Table 4, ignored the value of the conveyed real property which included: a convenience store, a service station, a youth center, soccer and softball fields, parks and playground, an Olympic-sized swimming pool, tennis and basketball courts as well as 670 family housing units. The Army Corps of Engineers valued the conveyed property at \$17.5 million (Kokocha, 2002). Using the same six percent growth rate and the five year time horizon Kokocha used to value the land at the time of conveyance, the value of the conveyed property would have been \$23.4 million.
2. The cost of impact aid, Table 3, was inappropriately applied to only MILCON housing. According to the Office of the Deputy Under Secretary of Defense Installations and Environment, most of DoD's privatization projects involve

leasing land from the government which does not affect the level of impact aid.

Therefore, the cost of impact aid to local school should not vary between

MILCON housing or privatization (OUSDIE).

3. Costs associated with deriving BAH rates, Table 5, are negligible and are applicable to each alternative; therefore, these costs should be omitted.

General Accounting Office (GAO) Findings

The GAO expressed similar concerns about implementing MHPI. It was found that construction and renovations were not being completed as efficiently or expeditiously as was proposed under MHPI.

The GAO reviewed 14 privatization projects that were either awarded or approved for solicitation. They found that two projects did not have completed lifecycle costs and the remaining 12 were incomplete, inaccurate, or inconsistently prepared. For example, seven projects did not include costs for project planning and design and three did not consider the value of government property to be conveyed to the developer as part of the agreement. The GAO found that, after correcting for deficiencies, the life cycle cost for privatization at Robbins AFB, Georgia cost the government nine percent more than Milcon construction and the privatization at Stewart Army Sub post, New York cost the government 15 percent more than Milcon construction would have cost. However, DoD officials stated that the privatization project was still in the best interest of the military because it was assumed that these projects could be completed faster and with substantially less initial government funds (GAO 2000).

The GAO expressed additional concern with respect to housing allowance. As housing allowance increases, the cost of privatization increases which leads to privatization becoming less viable as compared to traditional military construction. Reliance on contractors to fulfill their contractual obligations and the actual need of the privatized housing units over the next 50 years were additional concerns expressed by the GAO (GAO 2000).

RAND Study of Military Family Housing

In 1996, the Deputy Secretary of Defense John P. White requested a study of the preferences of military families for different types of housing and the factors that influence their choices. RAND examined military members housing preferences and tried to determine how and why families choose the housing they do. They also examined the attitudes toward living in military communities and discovered the following:

1. Families in Military Housing: The primary reason people chose to live on base housing was economic. Other reasons included security, convenience to work and availability. Having military neighbors was not considered important. These individuals were the least satisfied with 58 percent satisfaction on the quality of their residence.
2. Renters: Personnel chose to live in the local community because military housing was unavailable. Other reasons included avoiding rules, lack of privacy, and bad military housing. These individuals were 70 percent satisfied with the quality of their residence.
3. Homeowners: Investment and general economic motives and other reasons similar to renters. These individuals were most satisfied with a 93 percent satisfaction rate on the quality of their residence (Buddin, et al, RAND, 1999)

RAND concluded from the study that the big difference is economic. The value

of the housing benefit is larger if they can get into military housing. Economics weigh heavily in the service member's preference. Military members are drawn to the economy of on-base living and not by other features of military housing. Without the economic benefit, most military members see no compelling reason to live on base (Buddin, et al, RAND, 1999).

There are several issues, which could be dollarized on the relative value to families in military and civilian housing, as well as their relative costs. For example, common rationale for maintaining military housing in these communities include: fostering military culture, values, and cohesion; accelerating the acculturation of junior personnel, and facilitating support of families of deployed personnel. However, the RAND study further concluded that there was no difference in how well those in the military versus civilian housing thought their own neighbors look after their families while they were gone. Service members did not think living in military housing makes members more committed to the service or more productive at the military jobs. Instead, the majority of service members stated that military values were acquired in the workplace setting, rather than housing arrangements (Buddin, et al, RAND, 1999).

Summary

Providing adequate family housing for members of the military has always been a challenge for the DoD. Increased military strength and the percentage of married personnel coupled with shrinking defense budgets exacerbated the situation. Housing allowance and reliance on the local community have always been the preferred method of

housing military members. There are circumstances however, that reliance on the local community is not feasible.

DoD faced a severe housing shortage following WWII. In order to alleviate this problem, two of the largest housing privatization initiatives in U.S. history were created, Wherry and Capehart housing. Although these programs provided a large number of needed housing, they both had significant problems which resulted in their cancelation.

In an attempt to find a more effective means of providing family housing to members of the military, Decision Memorandum Review 966 (Operating Military Family Housing as a Business Enterprise) was introduced in October of 1990.

Two previous studies have been done on DMR 966; the first study researched Langley AFB, Virginia in 1991, the second researched the La Mesa housing program at the Naval Postgraduate School in Monterey, California. Both studies were completed prior to the creation of BAH. The housing allowance at that time, BAQ/VHA, assumed that members would incur up to 15% out of pocket housing expense. Even with the low housing allowance that would be forfeited to fund the family housing program, both studies found that it was feasible to operate MFH as a business enterprise but did not conclude that enough revenue would be generated to recapitalize the inventory.

One previous study compared three military family housing alternatives (Milcon, Privatization, and BAH) at Robins AFB, GA to determine which alternative yielded the greatest benefit for the cost to the government. This study neglected important costs which completely changed the results. The GAO identified these costs and concluded that privatization at Robins AFB would result in a higher life-cycle cost than would traditional military construction. Senior DoD officials decided to proceed with the more

expensive privatization project because it was assumed that these units could be built faster than traditional military construction. The GAO also commented on the cost to the government to privatize will increase as housing allowance increases.

The RAND Corporation examined housing alternatives and discovered that the primary reason families chose to live on-base is economic. They also discovered that personnel residing on-base were the least satisfied with the quality of housing and homeowners were the most satisfied with their quality of housing.

Given the increased housing allowance, this study expands on previous research by analyzing eight Air Force bases, at different locations across the U.S. that have not privatized, to determine the NPV of the proposed privatization projects using the principles outlined in DMRD 966. Increasing the number of bases analyzed will help generalize the finding throughout DoD.

III. Methodology

In order to accomplish the objective of this research which was to determine if there is value to the government by retaining ownership of housing facilities applying the principles outlined in DMRD 966, five actions needed to take place. First, select eight installations to analyze. Second, gather operating and maintenance costs at each location to determine the per unit maintenance cost. Third, determine potential annual revenue at each installation. Fourth, determine construction and demolition costs associated with each proposed project. Fifth, determine the value to the government by calculating the Net Present Value (NPV) at each location.

Identifying Installations

The installations that were identified needed to be installations that have not yet privatized, have a projected plan for privatization that will list the size and scope of the proposed project, and be disbursed across the United States so as to represent a sample of military installations throughout the continental United States.

Operating and Maintenance Costs:

The costs from these installations represent family housing operations that are not operating under a profit motive. These installations are hindered from finding economic efficiencies due to regulatory constraints; therefore, they represent a worst case scenario. These costs are grouped into various Budget Program Activity Codes (BPAC). Total

annual costs, at each location, were divided by the total number of housing units at the installation to arrive at a per unit operating and maintenance cost. Each BPAC is further broken down into projects and subprojects. The following projects/subprojects represent all costs associated with military family housing operations:

Subproject 721.11 Management-Government Dwellings.

This subproject includes all direct administration costs to support government-owned family dwelling units at installation level. This includes management office personnel, supplies, equipment, custodial services, occupancy inspections and surveys, etc., for the family housing office functions (AFMAN 65-604).

Subproject 721.21 Services-Government Dwellings.

This subproject includes the costs of municipal-type services, such as refuse collection and disposal, entomological services, and custodial services, etc, that support government-owned family housing units. This subproject also includes costs for fire and police protection when those services are for the exclusive support of government-owned family housing areas (AFMAN 65-604).

Subproject 721.41 Furnishings-Government Dwellings.

This subproject includes the costs of government-owned furnishings provided to government-owned family dwelling units. This includes replacement, increases to inventories, maintenance and repair, moving and handling of household furniture, equipment, and domestic appliances not installed (AFMAN 65-604).

Project 722 identifies costs associated with maintenance expenses and are broken down into the following subprojects:

Subproject 722.62 Maintenance and Repair-Government Dwellings.

This subproject includes all maintenance and repair of government-owned family housing units, whether provided by in-service personnel or separately contracted by the government. This includes installed equipment such as hot water heaters, dishwashers, garbage disposals, furnaces, air conditioners and interior utilities as authorized. It also includes cleaning and clearing of government quarters, after change of occupancy maintenance (AFMAN 65-604).

Subproject 722.66 Self-Help Store-Government Dwellings.

This subproject includes all costs of self-help bench stock-type materials issued to military family housing occupants to perform minor maintenance and repair on their dwelling units. It also includes the cost of personnel who manage the self-help store, or issue materials and tools to housing occupants (AFMAN 65-604).

Subproject 722.71 Maintenance and Repair of Utilities (Exterior)-Other.

This subproject includes all maintenance and repair of exterior utility systems that primarily serve family housing units or areas. It excludes utility lines or mains that may pass through or in front of family housing locations, but which serve other base locations and facilities (AFMAN 65-604).

Subproject 722.81 Maintenance and Repair of Other Real Property-Other.

This subproject includes all maintenance and repair of other real property facilities such as roads, driveways, walks, common grounds, and community facilities, etc., that are integral to a family housing area (AFMAN 65-604).

Subproject 722.91 Minor Alterations-Government Dwellings.

This subproject includes the costs of minor alterations to government-owned dwelling units (AFMAN 65-604).

Subproject 722.96 Major Maintenance and Repair-Government Dwellings.

This subproject includes major maintenance and repair projects on government-owned family housing units including those damaged or destroyed (AFMAN 65-604).

Subproject 722.97 Major Maintenance and Repair-Other.

This subproject includes major maintenance and repair to other real property, private housing where authorized, and buildings directly associated with a family housing area including those damaged or destroyed (AFMAN 65-604).

Subproject 728.11 Utilities-Government Dwellings.

This subproject includes costs of utilities consumed in government-owned family dwelling units. It also includes cost of reimbursable utility services furnished to civilian occupants of CONUS government quarters. It provides for:

1. The cost of water procured or produced for consumption.
2. The cost of electricity procured or produced.
3. The cost of gas, fuel oil, and coal (including delivery costs, if applicable) procured.
4. The cost of sewage disposal procured or produced.
5. The cost of base produced utilities transferred to family housing, the cost of heating and air conditioning plant operations, and the cost of other utilities or fuels, such as steam, coal, etc., provided to government-owned family dwelling units.
6. Utility construction amortization costs.

Determine Potential Annual Revenue at Each Location:

Annual revenue at each location was calculated by: finding the average rank structure occupying units at the respective installation, applying 2009 BAH rates for the occupants of each rank at that location, and determining average occupancy rate.

Determine Construction, Renovation, and Demolition Costs at Each Location:

The size and scope of the proposed privatization project at each location was used to determine the construction, renovation, and demolition costs at each location. It was assumed that all new construction will be a single family 2,032 square foot home with a two car garage. It was also assumed that newly constructed houses will have a useful life of 60 years requiring renovations after 30 years.

Renovations were assumed to have a useful life of 30 years. Existing housing units at the installation, that are not being replaced or renovated, were assumed sufficient for 15 years, at which time they will be renovated and have an additional useful life of 30 years. These units will need to be replaced 45 years following inception of the project. Because home renovations will be cosmetic in nature, it was assumed that renovation costs will be 50% of new construction costs minus the cost of the garage.

Demolition cost of \$5/square foot is provided by Mr. Michael R. Taylor, the executive director of the National Demolition Association. This cost represents the full cost of demolition and disposal (Taylor, 2009).

Determining the Value to the Government

Due to the problems highlighted by the GAO, listed in Chapter 2, and the difficulty in acquiring all relevant costs for privatization projects, a cost benefit analysis will not be included in this research.

Similarly, evaluating projects on the basis of payback period ignores the value stream beyond the payback period and may lead to a suboptimal decision point. As such, payback period will not be included in the research.

NPV will be the primary evaluation method for this research as it encompasses all income and expenses throughout the duration of the project.

Net Present Value:

NPV is an indicator of how much value an investment or project adds to the organization by discounting future cash flows back to present value (Brigham and Ehrhardt, 2007). The NPV was determined by finding the present value of 50 years of net rental revenue generated throughout the contract length of current privatization projects minus the initial construction and renovation costs. The following formula is used to derive NPV:

$$\sum_{t=1-55}^n \frac{Rt}{(1+i)^t}$$

Where,

t - the time of the cash flow

i - the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk.)

R_t - the net cash flow (the amount of cash, inflow minus outflow) at time t

Summary

In order to determine which housing alternative will provide the greatest value to the government and the American tax payer, a per unit operation and maintenance cost was calculated. These costs were collected from eight Air Force installations that have not yet privatized and represent a worst case scenario as they are not operating under a profit motive. The average annual revenue stream was determined by using the average BAH payment along and the average occupancy rate. The size and scope of the future privatization plans for these installations were used to determine if these projects could be developed using DMRD 966 principles retaining government ownership of these housing units. The NPV was calculated to determine the value to the government. Generalizability across DoD was determined by including a representative sample of military installations in the analysis.

V. Results

The five actions that needed to take place to accomplish the objective of this research, which is to determine if there is value to the government by retaining ownership of family housing units were: identify eight installations that have not yet privatized, gather cost data for each installation, determine potential annual revenue at each location, determine construction and demolition costs, and evaluate the net present value of the proposed privatization project using 966 housing principles.

Identifying Bases

The following installations were selected for this research project because they have not yet privatized, each location has a proposed privatization plan highlighting the size and scope of the project, and are disbursed across the United States serving as a representative sample of military installations across the continental United States. These installations were analyzed to determine the value of implementing 966 housing:

- Minot AFB, ND
- McChord AFB, WA
- Shaw AFB, SC
- Cannon AFB, NM
- Edwards AFB, CA
- Mountain Home AFB, ID
- McConnell AFB, KS
- Malmstrom AFB, MT

Gathering Cost Data

With the exception of Cannon AFB, four years of costs data was collected for each location starting in year 2005 and ending in year 2008. Each year was normalized to 2008 dollars by multiplying the costs in the respective year by a normalizing multiplier. This provided a four year average O&M cost (Table 7). Only 2008 O&M costs were collected for Cannon AFB due to a transfer of the base to a different Major Command.

Table 7 Normalizing Multipliers

Normalizing Multipliers		
	CPI	Multiplier
Jan-05	190.70	1.11
Jan-06	198.30	1.06
Jan-07	202.42	1.04
Jan-08	211.08	1.00

The multiplier was calculated by dividing the 2008 CPI value by the CPI value in the respective year.

Table 8 lists the average O&M cost, in 2008 eight dollars, at each location and includes the high cost of maintaining older inefficient units as well as the utility expenses paid by the government. These costs represent a worst case scenario.

Table 8 Operation and Maintenance Costs

Operation and Maintenance Costs		
	Number of Housing Units	Four year average monthly O&M cost per unit
Shaw AFB, SC	1,171	\$564.86
Cannon AFB, NM	1,303	\$398.33
Edwards AFB, CA	1,211	\$803.75
McConnell AFB, KS	493	\$887.90
Malmstrom AFB, MT	1,192	\$446.30
McChord AFB, WA	978	\$401.16
Minot AFB, ND	1,428	\$554.81
Mt. Home AFB, ID	1,381	\$350.78

The number of housing units used to derive the per unit O&M cost was provided by the respective installations housing manager. This number differs from the number of housing units used in the NPV calculation as a portion of the housing inventory, at each location, will remain under government ownership. Only the number of housing units conveyed to the developer will be used in the NPV calculation. A complete breakdown of costs by subproject can be found in appendix B.

Determine Potential Annual Revenue at Each Location

The potential annual revenue, for each installation, was calculated by multiplying the average BAH payment of each location (Table 9) by the average number of units occupied.

The average BAH payment, at each installation, was calculated by summing total BAH payments received, applying the 2009 BAH rates to the current occupant's rank, and dividing by the total number of units occupied.

The number of units occupied, at each installation, was calculated by multiplying the total number of units available by the assumed occupancy rate of 94%. The 94% occupancy rate was selected because it represented a slightly more conservative ratio than the average occupancy rate, for all finished privatized housing units, of 96.6% as provided by Mr. Harry Mamaux, Air Force privatization point of contact (Mamaux 2009). To further validate the assumed 94% occupancy rate, eight privatized housing projects were selected (Table 11) and an occupancy rate of 94.26% was discovered (PEP, 2008).

Only three of the eight installations provided the current occupant's rank. This rank breakdown was a snapshot in time during a period of high transition and therefore does not represent the average annual occupancy level. To calculate the ranks of the average annual occupancy level for all eight installations, a weighted average ratio of those occupants from the three bases that provided the information, was calculated and multiplied by the number of occupants at all eight installations. For example, (Table 10) Edwards, Minot, and Mountain Home AFBs provided current occupants' rank. The total number of each rank was summed and divided by the sum of the total occupants of all three bases in order to calculate a percentage ratio. That percentage ratio, for the respective rank, was multiplied by the total number of units occupied to determine the rank structure occupying unit's throughout the year at all eight installations.

The number of each rank, at the respective installation, was then multiplied by the 2009 BAH rates and divided by the total number of occupied. Additional information, including occupant's rank and annual BAH payments, for each installation can be found in Appendix C.

Table 9 Average BAH Payments

Average B AH Payment			
Installation	Houses Available	Houses Occupied	Average monthly BAH payment
Edwards AFB	675	635	\$1,531.27
Minot AFB	1366	1284	\$1,063.60
Mountain Home AFB	1051	988	\$1,059.06
McChord AFB	978	919	\$1,536.59
Shaw AFB	1171	1101	\$1,031.24
McConnell AFB	493	463	\$1,067.40
Malmstrom AFB	1192	1120	\$958.47
Cannon AFB	1303	1225	\$1,095.96

Table 10 Occupancy Data

Data provided by housing manager					
Grade	Edwards	Minot	Mountain Home	Total	Percentage
0-6	13	11	3	27	1.03%
0-5	30	40	27	97	3.68%
0-4	43	27	17	87	3.30%
0-3	47	89	18	154	5.85%
0-2	18	27	4	49	1.86%
0-1	0	34	6	40	1.52%
E-9	10	8	8	26	0.99%
E-8	9	24	6	39	1.48%
E-7	49	97	41	187	7.10%
E-6	104	177	95	376	14.28%
E-5	133	326	201	660	25.07%
E-4	54	227	147	428	16.26%
E-3	39	230	147	416	15.80%
E-2	6	19	11	36	1.37%
E-1	3	2	6	11	0.42%
Total	558	1338	737	2633	1

Table 11 Privatized Occupancy Rates

Privatized Housing Occupancy Rates	
Installation	Occupancy Rate
Hill	95.90%
Buckley	98.00%
Robins 1	94.20%
Robins 2	89.30%
Lackland	94.80%
Wright Patterson	79.60%
Elmendorf1	99.00%
Elmendorf 2	98.10%
Nellis	95.50%
Dover	98.20%
Average occupancy rate:	94.26%

Table 12 identifies the number of units that are to be conveyed at each installation as well as the end state inventory:

Table 12 Privatization Plans

Privatization Plan by Installation						
Installation	Units to be conveyed	End State inventory	Units to be Demolished	Units to be Updated	Units to be replaced	Units Unchanged
Shaw AFB	735	787	732	0	784	3
Cannon AFB	886	1034	274	349	422	612
Edwards AFB	1002	796	206	0	0	796
McConnell AFB	493	441	124	50	72	369
Malmstrom AFB	932	842	90	179	0	842
McChord AFB	978	608	620	268	250	358
Minot AFB	1226	1226	110	30	110	1116
Mt. Home AFB	1319	1324	475	0	480	844

Only the end state housing inventory was used to calculate annual revenue and NPV. Once the average BAH was calculated, the annual revenue for each installation was calculated by multiplying the average BAH rate by the occupied units of the conveyed end state inventory assuming a 94 percent occupancy rate (table 13).

Table 13 Revenues by Installation

Monthly and Annual Revenue					
Installation	Total Inventory	Number of Units Occupied @ 94% occupancy	Average BAH Payment	Total Monthly Revenue	Total Annual Revenue
Shaw AFB	787	740	\$1,035.76	\$766,237.04	\$9,194,844.47
Cannon AFB	1034	972	\$1,100.07	\$1,069,223.92	\$12,830,687.07
Edwards AFB	796	748	\$1,536.60	\$1,149,742.51	\$13,796,910.18
McConnell AFB	441	415	\$1,071.16	\$444,039.88	\$5,328,478.58
Malmstrom AFB	842	791	\$962.03	\$761,427.81	\$9,137,133.70
McChord AFB	608	572	\$1,543.02	\$881,868.38	\$10,582,420.60
Minot AFB	1226	1152	\$1,069.17	\$1,232,151.38	\$14,785,816.58
Mt. Home AFB	1324	1245	\$1,062.61	\$1,322,478.06	\$15,869,736.70

Determine Construction and Demolition Costs

According to the U.S. Census, the average U.S. house size is 2,032 square feet (Census, 2003). It is assumed that each newly constructed unit will be a single family detached 2,032 square foot house with a 20' x 20' two car garage.

The construction cost, \$95.90 per square foot of net living space, was provided by Saylor Publications, a company that provides construction cost data and construction consulting nationwide for: contractors, estimators, architects, planners, project managers, construction consultants, and government agencies. In addition to the \$95.90 per square foot of living space, a construction cost of \$44.50 per square foot of garage space was provided. These construction costs reflect costs in California; Saylor Publications provides an adjustment multiplier to reflect true build costs in each state (Saylor, 2009)

As stated in Chapter three, demolition cost of \$5/square foot, is provided by Mr. Michael R. Taylor, the executive director of the National Demolition Association. This cost represents the full cost of demolition and disposal (Taylor, 2009).

Table 14 identifies the construction and renovation costs per unit at all eight installations. Details of these costs can be found in appendix D.

Table 14 Construction Costs

Construction Costs					
Installation	Adjustment Multiplier	Construction Cost of Net Living Space Per Unit	Garage Construction Cost per Unit	Total New Construction Build Cost	Renovation Cost per Unit
Shaw AFB	0.75	\$146,151.60	\$13,350.00	\$159,501.60	\$73,075.80
Cannon AFB	0.83	\$161,741.10	\$14,774.00	\$176,515.10	\$80,870.55
Edwards AFB	1	\$194,868.80	\$17,800.00	\$212,668.80	\$97,434.40
McConnell AFB	0.81	\$157,843.73	\$14,418.00	\$172,261.73	\$78,921.86
Malmstrom AFB	0.84	\$163,689.79	\$14,952.00	\$178,641.79	\$81,844.90
McChord AFB	0.94	\$183,176.67	\$16,732.00	\$199,908.67	\$91,588.34
Minot AFB	0.81	\$157,843.73	\$14,418.00	\$172,261.73	\$78,921.86
Mt. Home AFB	0.85	\$165,638.48	\$15,130.00	\$180,768.48	\$82,819.24

Determining the Net Present Value

As previously stated NPV is an indicator of how much value an investment or project adds to the organization by discounting future cash in-flows and cash out-flows back to present value (Brigham and Ehrhardt, 2007).

This NPV analysis included 50 years of cash flows, the contract period of privatized housing projects, to determine if there is value to the government in retraining ownership of housing units. The following assumptions were used in this analysis:

1. Newly constructed housing units have a useful life of 60 years, requiring renovation after 30 years.
2. Renovations will add 30 years of useful life.

3. Existing units not demolished or renovated at the inception of the project will be sufficient for 15 years adding 30 years of useful life. These units will be replaced 45 years from the time of inception.
4. Because renovations will be cosmetic in nature, renovation costs will equal 50% of new construction costs minus the cost of the garage.
5. Demolition costs will remain constant at \$8,128 per unit (\$5/sf*2032 sf) as provided by Mr. Taylor.
6. The discount rate used is 2.87% the average thirty year inflation indexed treasury bond averaged between 1998 and 2008 (Fed Reserve, 2009)

Funds will be required at the inception of the project, year 15, year 30, and year 45. The first question this research intended to answer was the financial value of retaining ownership and implementing 966 housing principles at the time MHPI was signed into law. Applying the expectation of military members paying 15 percent of their housing cost out of pocket, the annual revenue at each installation was reduced by 15 percent in order to determine if it would have been financially advantageous to implement 966 housing in place of MHPI. The result of this reduction in annual revenue, maintaining the same expenses and assumptions, yielded a NPV of -\$180.1M for the installation portfolio. This indicates the value to the government to privatize these eight installations. These results can be found in Table 15.

Table 15 NPV Calculation for 85% Housing Expense

NPV Calculations @ 85% Housing Expense						
Bases	Net Annual Revenue	Funds required at inception	Funds required in year 15	Funds required in year 30	Funds required in year 45	NPV
Shaw	\$2,445,153.22	\$131,615,294.40	\$219,227.40	\$57,291,427.20	\$505,414.80	(\$90,401,375.48)
Cannon	\$4,899,820.43	\$105,170,976.54	\$21,268,955.18	\$98,861,674.24	\$48,782,582.35	(\$44,304,154.90)
Edwards	\$4,007,968.86	\$1,847,820.00	\$77,557,782.40	\$0.00	\$176,424,484.80	\$5,189,109.77
McConnell	-\$185,470.84	\$17,461,217.62	\$25,176,074.62	\$14,743,960.61	\$57,812,921.23	(\$60,695,586.93)
Malmstrom	\$3,228,405.12	\$15,457,536.38	\$54,263,166.05	\$33,582,510.77	\$124,386,618.10	(\$13,928,204.97)
McChord	\$6,028,213.55	\$80,084,242.05	\$8,242,950.24	\$78,876,568.10	\$18,799,080.48	\$36,146,936.72
Minot	\$4,340,134.16	\$22,303,146.00	\$85,709,144.30	\$14,118,356.88	\$196,817,656.61	(\$22,933,617.50)
Mt. Home	\$8,339,484.73	\$91,029,620.40	\$69,899,438.56	\$39,753,235.20	\$160,139,277.12	\$10,815,526.32
Total NPV					-\$180,111,366.97	

The second question this research intended to answer was the financial value of retaining ownership of family housing and implementing 966 housing principles now that housing allowance has been increased to provide 100 percent of all housing needs. Table 16 illustrates the NPV for each installation analyzed and includes the increased housing allowance.

Table 16 NPV Calculation for 100% Housing Expense

NPV Calculations							
Installations	Annual Revenue	Annual Costs	Funds required at inception	Funds required in year 15	Funds required in year 30	Funds required in year 45	NPV @ 2.87%
Shaw	\$9,194,844.47	\$5,336,332.20	\$130,998,950.40	\$219,227.40	\$57,291,427.20	\$502,888.80	-\$54,021,306.62
Cannon	\$12,830,687.07	\$5,965,518.24	\$104,940,268.54	\$21,268,955.18	\$98,567,816.24	\$48,561,136.35	\$6,461,388.86
Edwards	\$13,796,910.18	\$7,678,757.28	\$1,674,368.00	\$77,557,782.40	\$0.00	\$175,754,252.80	\$59,777,585.31
McConnell	\$5,328,478.58	\$4,698,766.80	\$17,356,809.62	\$25,176,074.62	\$14,701,860.61	\$57,544,323.23	-\$39,613,075.05
Malmstrom	\$9,137,133.70	\$4,509,415.20	\$15,381,756.38	\$54,263,166.05	\$33,431,792.77	\$123,828,372.10	\$22,223,527.04
McChord	\$10,582,420.60	\$2,929,344.00	\$79,562,202.05	\$8,242,950.24	\$78,650,912.10	\$18,723,300.48	\$78,017,051.17
Minot	\$14,785,816.58	\$8,162,364.72	\$22,210,526.00	\$85,709,144.30	\$14,093,096.88	\$195,903,244.61	\$35,567,537.92
Mt. Home	\$15,869,736.70	\$5,573,192.64	\$90,629,670.40	\$69,899,438.56	\$39,753,235.20	\$159,428,629.12	\$73,605,290.31
Total NPV						\$182,017,998.94	

It is clear to see that some installations have a negative NPV which indicates value to the government to privatize. However, combining these eight installations into a portfolio provides a NPV to the government of over \$182M if ownership is retained and 966 housing principles are implemented. As BAH rates were increased, eliminating out of pocket housing expense to the military member, the value to the government to retain ownership of military family housing increased as well.

By comparison, the government will generate no revenue from bases that have privatized; only expenses from the privatization effort will be accrued. Without revenue to offset expenses associated with privatized housing projects, the NPV to the government to privatize military family housing is negative. Again, the definition of NPV is an indicator of how much value an investment or project adds to the organization by discounting future cash flows back to present value (Brigham and Ehrhardt, 2007).

The two factors that would have the greatest effect on the NPV results are the discount rate and the useful life of housing units. A sensitivity analysis was completed that altered the discount rate from 1.87% to 3.87% and the useful life from 50 years to 70 years. The results of this analysis are found in Table 17. Complete information on cash flows and interest rates for all NPV calculations can be found in appendix D.

Table 17 Sensitivity Analysis

Sensitivity Analysis Matrix			
Interests Rates	Useful Life of Housing Units		
	50 Year	60 Year	70 Year
1.87%	\$190,171,478.62	\$253,515,857.14	\$597,842,405.52
2.87%	\$117,382,848.70	\$182,017,998.94	\$409,843,474.31
3.87%	\$59,858,462.11	\$119,885,848.60	\$271,857,645.78

V. Conclusions and Recommendations

The objective of this research was to determine if there is value to the government by retaining ownership of family housing and implementing 966 housing principles. This was done by gathering cost data, calculating annual revenue, and deriving the NPV for eight Air Force installations. The NPV for the current BAH system was calculated and compared to the NPV under the previous housing allowance system, assuming fifteen percent out of pocket expense to the military member, to determine the feasibility of implementing 966 housing in place of MHPI.

Conclusions

It is clear to see that at the time MHPI was signed into law, the value to the government to privatize military family housing was significant and provided greater financial value to the government than implementing 966 housing. This financial advantage changed when BAH entitlement increased eliminating out of pocket expense. Under the current BAH entitlement policy, the government is forgoing \$161.3M to privatize these eight installations alone. MHPI is no longer in the financial best interest of the government.

According to the Office of The Under Secretary of Defense Installations and Environment, “The biggest advantage of privatization is not monetary, but rather the speed at which these houses can be renovated and constructed by the private sector, and

the quality of the housing and housing maintenance that the residents receive almost immediately” (OUSDIE 2009).

The results of five of the eight privatized installations sampled suggest a different result. Four installations: Hill AFB, Robins AFB, Nellis AFB, and Wright-Patterson AFB all reported significant delays in the construction and renovation process. The reasons for these delays include: monetary issues, environmental issues, and legal issues. Buckley AFB reported deficient construction requiring additional mediation (PEP, 2008).

The most visible setback in the privatization effort involved American Eagle, a large development company, the owners of which had a record of dishonest dealings and had previously filed bankruptcy. American Eagle took ownership of 8,000 military homes and later defaulted on the contract which cost the government and the American tax payer millions of dollars (Nalder, 2008).

Although currently not an issue, previous privatization efforts have resulted in local governments imposing property taxes on privatization projects. This increased expense has a negative effect on the success of the project leading to decreased quality of housing and a lower standard of living for military members. Government ownership of housing is the most straight forward way of establishing tax exempt status (Morrison, 2005).

Another potential problem with the current housing privatization initiative is the increased number of general public occupants. Table 17 identifies four of the eight sampled installations that reported renting to the general public (PEP 2008).

Table 18 General Public Occupancy

General Public Occupancy	
Installation	Number of General Public Occupants
Nellis AFB	2
Dover AFB	67
Wright-Patterson AFB	23
Robins AFB	151

As the number of general public occupants increase, the perceived benefits of residing in a military community will decrease. Additionally, the amount of rent charged to civilians is not equal to the BAH collected from military members. Military members residing on the same street that is open to the general public are authorized a rent reduction to equal the amount of rent charged to the general public at Wright-Patterson AFB (Dalton 2009). The disparity in rents may lead to a perception of inequality among military members not authorized reduced rents.

Recommendations

After analyzing the NPV of eight installations that have not privatized and sampling eight installations that have privatized, it is recommended that DoD retain ownership of every military installation that has not yet privatized and implement the principles outlined in DMRD 966. In addition, establishing a defense wide non-profit housing authority to oversee housing throughout DoD is also recommended which echoes the action recommended by the Defense Science Board Task Force in their 1995 report to SECDEF William Perry. By maintaining the organic capacity to provide family housing

needs, DoD will not only maintain a financial advantage but the government will no longer be subject to the financial instability of the economy or irresponsible developers. Additionally, any potential property tax issues will be avoided.

Excess funds generated through 966 housing could be pooled and made available to recapitalize the inventory. This will eliminate the need to appropriate future funds which will expedite the construction process and place the efficiency of military construction equal to private development. Using recapitalization funds to replace housing units will result in a larger NPV as interest paid for these projects will be eliminated. An increase in NPV translates to greater financial value to the government.

In the article entitled *The Political Economy of Outsourcing*, Arie Halachmi and Robert Boydston point out that one of the problems of outsourcing is the reallocation of overhead. When a service is outsourced the overhead of the old service is gone and is considered a savings while the elements of the old overhead costs must be redistributed among the remaining function (Halachmi, Boydston 2009). This could be true for housing privatization. MILCON appropriation will be significantly reduced simultaneously increasing Military Personnel (MILPERS) appropriation as BAH is paid under the MILPERS appropriation.

In addition to the reasons why 966 housing should be successful listed in Chapter 1, privatized housing communities experience half the delinquency rates than the civilian sector experiences. This has been attributed to allotted rent payments and responsible nature of military members to pay their obligations (PEP 2008).

By maintaining ownership of military family housing, the need to ensure developers are living up to their contract agreement will be eliminated. Additionally, the

government will not be contractually obligated to honor the privatization contract if it is determined that the military no longer needs the housing units.

Limitations:

One limitation not addressed in this research, which would play a significant role in the successful implementation and operation of 966 housing, is the ability to limit any excess funds collected from being transferred by Congress to support various budget shortfalls. According to Patricia Heil, the Air Force's MILCON appropriation point of contact (POC), military family housing has never been a must pay bill. During lean budget years, military family housing has suffered. MILPERS, on the other hand, is a must pay bill. Paying everybody BAH obligates the government to provide adequate funding to maintain military family housing (Heil 2009). Maintaining the principle of paying BAH, in the must pay MILPERS appropriation, but recapturing the BAH through 966 housing, will ensure adequate funding for family housing operations including recapitalization and will provide a significant financial advantage to the government and the American tax payer.

As previously mentioned, the O&M costs used in this research are the costs needed to maintain older, inefficient units and represent the costs associated with installations that are not operating under a profit motive and include utility bills being paid by the government. These O&M costs could be reduced when older inefficient housing units are replaced and individual meters are placed on housing units which would shift the responsibility of energy consumption to the occupant. Further savings

could be achieved if regulatory restrictions were lifted allowing installations to achieve economies of scale and other cost savings techniques. Construction cost estimates were calculated on a single stand alone, 2032 square foot house. Economies of scale would be achieved by contracting for the construction of numerous homes. The per unit construction cost could be reduced by constructing multi-family units or reducing the size of each unit. Any reduction in O&M costs or construction costs will lead to a higher NPV leading to greater value to the government to retain ownership of family housing units. Additionally, the BAH used to calculate the annual revenue, for each installation, excluded the prior enlisted pay status. Including the increased housing allowance will increase the annual revenue which will result in a higher NPV.

Another limitation of this study is the fact that truncated costs for civilian retirement and other benefits were not included. It could be argued however, that the military currently maintains a housing referral office staffed by government employees. These costs could be considered a fixed cost which would be paid regardless of whether privatization was implemented or not.

Similarly, the cost of implementing a DoD wide defense housing authority to oversee 966 housing was not included in the research. It could also be argued that DoD is currently staffing positions to oversee the privatization effort. These costs could be transferred to the cost of implementing the housing authority.

The final limitation mentioned in this research is the fact that this research was completed under the DoD perspective. Cost savings achieved within DoD may or may not translate to total cost savings for the government as a whole.

Follow-on Research:

As was previously mentioned, removing one service often shifts the costs of that overhead to another area. Additional research could be done to determine if cost savings were actually achieved by privatizing or has the expense been shifted laterally from the MILCON appropriation to the MILPERS appropriation?

Since single member housing experiences the same challenges that family housing faces, additional research could be done for single member housing using the same research techniques.

Given the value to the government to retain ownership of family housing, additional research could be done to determine the price at which the government could purchase privatized housing projects maintaining a pre-determined NPV.

Implementing DMRD 966 housing principles for MFH may violate fiscal regulatory guidance. Further research is needed to determine if this operation shift is permitted under the current fiscal constraints. Additionally, what color of money would the collected BAH payments be and how would these funds be handled?

Appendix A Basic Allowance for Housing

Basic Allowance for Housing Compared to VHA/BAQ	
Problem: VHA/BAQ	Remedy: BAH
<ul style="list-style-type: none"> • Member gets less money when new published rates are lower 	Rate Protection -- When new rates are published, (Jan 1) no individual will see a decrease in the BAH they are receiving.
<ul style="list-style-type: none"> • Creeping growth in out-of-pocket costs 	Delinked growth in housing allowances from the pay raise, which historically lagged behind housing inflation. Instead BAH is linked to housing cost growth, putting an end to out-of-pocket creep.
<ul style="list-style-type: none"> • The so-called Death Spiral: When low allowances force members into inadequate housing, and they report low costs on the VHA survey, which, in turn, drives the allowances further down 	Fairer, more accurate measurement of housing costs, based on housing costs in each area--not what the member is spending.
<ul style="list-style-type: none"> • VHA OFFSET (A reduction of housing allowance if the cost of quarters was less than VHA). 	BAH is a flat rate. Members spending less than their housing allowance no longer have their allowance reduced.
<ul style="list-style-type: none"> • Geographic/ pay grade inequity 	<p>Same dollar amount out-of-pocket for a pay grade at all geographic locations. Same percent* out-of-pocket for every grade</p> <p>*relative to the nation-wide (NOT local) median cost of housing by pay grade</p>
<ul style="list-style-type: none"> • Burdensome annual recertification of actual housing cost 	No need to furnish copies of leases or mortgage documents
<ul style="list-style-type: none"> • Pay grade rate inversions 	Published BAH rates will not decrease with pay grade

	(after transition)
• Burdensome annual member survey of housing costs	No VHA survey
• Drastic changes in any year	Multi-year transition
• Slow response to housing cost inflation	BAH based entirely on current housing market data

Appendix B Complete O&M Costs

Shaw AFB		2005	2006	2007	2008
Management	72111	\$458,880.53	\$449,954.67	\$440,624.15	\$448,057.48
Services	72121	\$258,981.38	\$208,959.85	\$167,424.54	\$276,498.51
Furnishings	72141	\$168,790.05	\$193,318.69	\$152,883.39	\$163,619.31
Maintenance and Repair of Government Dwellings	72262	\$2,818,541.23	\$2,805,751.08	\$2,823,784.85	\$3,290,628.45
Self Help	72266	\$106,114.16	\$130,973.95	\$165,080.01	\$138,178.28
Maintenance and Repair of Utilities	72271	\$18,801.79	\$18,782.50	\$14,976.03	\$28,362.50
Maintenance and Repair of Other Real Property	72281	\$214,019.06	\$244,426.15	\$194,326.23	\$222,758.99
Minor Alterations-Government Dwellings	72291	\$8,496.56	\$2,489.04	\$6,274.99	\$865.98
Major Repair of Government Housing	72296	\$1,671,103.02	\$3,195,387.18	\$2,130,736.40	\$87,915.95
Major Repair of Private Housing	72297			\$35,497.64	
Operating Cost least Family Housing	725				
Maintenance Least Family Housing	726				
Privatization	727	\$9,721.02			
Utilities for Government Dwellings	72811	\$2,115,061.69	\$2,233,691.67	\$1,848,156.03	
Utilities Other	72812				
Total Cost		\$7,848,510.49	\$9,483,734.78	\$7,979,764.26	\$4,656,885.45
Yearly cost per unit		\$6,702.40	\$8,098.83	\$6,814.49	\$3,976.84
Monthly cost per unit		\$558.53	\$674.90	\$567.87	\$331.40
Number of Housing units	1171				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost		\$8,687,276.32	\$10,094,940.68	\$8,321,321.63	\$4,656,885.45
Yearly cost per unit		\$7,418.68	\$8,620.79	\$7,106.17	\$3,976.84
Monthly cost per unit		\$618.22	\$718.40	\$592.18	\$331.40
Number of Housing units	1171				
Average Cost per unit	\$565.05				

Appendix B Complete O&M Costs

Cannon AFB		2005	2006	2007	2008
Management	72111				\$555,436.92
Services	72121				\$201,431.52
Furnishings	72141				\$22,397.89
Maintenance and Repair of Government Dwellings	72262				\$2,590,670.54
Self Help	722666				\$0.00
Maintenance and Repair of Utilities	72271				\$21,717.50
Maintenance and Repair of Other Real Property	72281				\$16,455.73
Major Repair of Government Housing	72296				\$1,552,000.00
Major Repair of Private Housing	72297				\$0.00
Operating Cost least Family Housing	725				\$3,561,136.22
Maintenance Least Family Housing	726				\$1,284,970.43
Privatization	727				\$4,238.12
Utilities for Government Dwellings	72811				\$1,268,143.93
Utilities Other	72812				\$0.00
Total Cost					\$11,078,598.80
Yearly cost per unit					\$8,502.38
Monthly cost per unit					\$708.53
Number of Housing units	1171				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost					\$11,078,598.80
Yearly cost per unit					\$8,502.38
Monthly cost per unit					\$708.53
Number of Housing units	1171				
Average Cost per unit	\$565.05				

Appendix B Complete O&M Costs

Edwards AFB		2005	2006	2007	2008
Management	72111	\$757,386.97	\$1,026,227.00	\$963,136.32	\$903,179.17
Services	72121	\$527,974.89	\$607,469.67	\$807,709.50	\$579,454.98
Furnishings	72141	\$10,805.90	\$1,035.90	\$0.00	\$12,728.48
Maintenance and Repair of Government Dwellings	72262	\$4,180,931.38	\$3,793,080.51	\$2,662,508.84	\$2,307,905.45
Self Help	72666	\$0.00	\$0.00	\$0.00	\$0.00
Maintenance and Repair of Utilities	72271	\$63,714.04	\$11,463.50	\$18,915.22	\$2,743.93
Maintenance and Repair of Other Real Property	72281	\$1,057,678.88	\$3,937,400.63	\$1,599,849.96	\$1,251,620.07
Major Repair of Government Housing	72296	\$3,521,080.79	\$29,996.00	\$0.00	\$0.00
Major Repair of Private Housing	72297	\$0.00	\$0.00	\$0.00	\$0.00
Operating Cost least Family Housing	725	\$0.00	\$0.00	\$0.00	\$0.00
Maintenance Least Family Housing	726	\$0.00	\$0.00	\$0.00	\$0.00
Privatization	727	\$0.00	\$0.00	\$0.00	\$7,981.75
Utilities for Government Dwellings	72811	\$3,368,805.01	\$3,480,918.98	\$3,386,932.51	\$2,779,466.02
Utilities Other	72812	\$200,168.07	\$108,944.30	\$40,211.51	\$12,879.98
Total Cost		\$13,688,545.93	\$12,996,536.49	\$9,479,263.86	\$7,857,959.83
Yearly cost per unit		\$11,303.51	\$10,732.07	\$7,827.63	\$6,488.82
Monthly cost per unit		\$941.96	\$894.34	\$652.30	\$540.73
Number of Housing units	1171				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost		\$15,151,433.01	\$13,834,134.76	\$9,885,004.23	\$7,857,959.83
Yearly cost per unit		\$12,511.51	\$11,423.73	\$8,162.68	\$6,488.82
Monthly cost per unit		\$1,042.63	\$951.98	\$680.22	\$540.73
Number of Housing units	1171				
Average Cost per unit	\$565.05				

Appendix B Complete O&M Costs

McConnell AFB		2005	2006	2007	2008
Management	72111	281,198.82	303,022.81	301,897.29	293,587.08
Services	72121	269,969.84	262,400.63	188,784.82	169,201.02
Furnishings	72141	44,802.61	45,891.68	44,576.70	60,061.36
Maintenance for real property facilities	722	161,610.00			
Maintenance and Repair of Government Dwellings	72262	1,406,295.15	1,416,020.35	2,588,327.72	948,140.65
Self Help	72266				
Maintenance and Repair of Utilities	72271	396,333.23	820,610.21	420,512.01	8,231.78
Maintenance and Repair of Other Real Property	72281	128,427.63	146,225.91	4,657,783.69	230,918.64
Minor Alterations-Government Dwellings	72291				
Major Repair of Government Housing	72296		769,973.99	1,133.19	
Major Repair of Private Housing	72297				
Operating Cost least Family Housing	725				
Maintenance Least Family Housing	726				
Privatization	727				
Utilities for Government Dwellings	72811	873,258.43	955,467.94	863,184.94	880,430.05
Utilities Other	72812				
Total Cost		3,561,895.71	4,719,613.52	9,066,200.36	2,590,570.58
Yearly cost per unit		7,224.94	9,573.25	18,389.86	5,254.71
Monthly cost per unit		602.08	797.77	1,532.49	437.89
Number of Housing units	493				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost		\$3,942,553.47	\$5,023,782.26	\$9,454,260.39	\$2,590,570.58
Yearly cost per unit		\$7,997.07	\$10,190.23	\$19,177.00	\$5,254.71
Monthly cost per unit		\$666.42	\$849.19	\$1,598.08	\$437.89
Number of Housing units	493				
Average Cost per unit	\$887.90				

Appendix B Complete O&M Costs

Malmstrom AFB		2005	2006	2007	2008
Management	72111	296,787.34	393,439.47	451,240.42	462,971.37
Services	72121	227,271.93	179,153.92	188,598.64	156,712.23
Furnishings	72141	149,270.00	86,950.08	257,340.00	147,530.88
Maintenance for real property facilities	722				
Maintenance and Repair of Government Dwellings	72262	1,526,023.76	1,541,357.42	1,680,856.03	1,585,519.80
Self Help	72266	102,130.13	115,131.98	154,442.84	62,861.00
Maintenance and Repair of Utilities	72271	172,761.80	97,798.46	106,632.15	131,572.05
Maintenance and Repair of Other Real Property	72281	1,613,069.48	996,382.26	2,523,242.84	383,164.77
Minor Alterations-Government Dwellings	72291				
Major Repair of Government Housing	72296	604,575.90	175,636.65	0.00	
Major Repair of Private Housing	72297				
Operating Cost least Family Housing	725				
Maintenance Least Family Housing	726				
Privatization	727				12.31
Utilities for Government Dwellings	72811	1,816,109.00	1,837,927.94	2,204,354.22	1,737,731.81
Utilities Other	72812				
Total Cost		6,507,999.34	5,423,778.18	7,566,707.14	4,668,076.22
Yearly cost per unit		5,459.73	4,550.15	6,347.91	3,916.17
Monthly cost per unit		454.98	379.18	528.99	326.35
Number of Housing units	1192				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost		\$7,203,505.51	\$5,773,328.79	\$7,890,584.46	\$4,668,076.22
Yearly cost per unit		\$6,043.21	\$4,843.40	\$6,619.62	\$3,916.17
Monthly cost per unit		\$503.60	\$403.62	\$551.63	\$326.35
Number of Housing units	1192				
Average Cost per unit	\$446.30				

Appendix B Complete O&M Costs

McChord AFB		2005	2006	2007	2008
Management	72111	\$373,296.28	\$373,170.19	\$376,900.56	\$394,839.09
Services	72121	\$242,008.93	\$238,494.18	\$244,151.95	\$213,899.13
Furnishings	72141	\$70,756.57	\$71,757.06	\$89,562.73	\$146,518.78
Maintenance and Repair of Government Dwellings	72262	\$2,435,208.55	\$2,232,673.90	\$3,114,295.74	\$1,863,764.75
Self Help	722666	\$134,981.42	\$58,548.47	\$32,296.62	\$29,916.53
Maintenance and Repair of Utilities	72271	\$38,819.68	\$125,497.12	\$43,952.80	\$31,124.20
Maintenance and Repair of Other Real Property	72281	\$172,587.82	\$198,012.68	\$161,731.21	\$146,713.90
Major Repair of Government Dwellings	72296	\$0.00	\$37,000.00	\$0.00	\$0.00
Major Repair of Government Housing	72297	\$0.00	\$0.00	\$0.00	\$0.00
Major Repair of Private Housing	725	\$0.00	\$0.00	\$0.00	\$0.00
Operating Cost least Family Housing	726	\$0.00	\$0.00	\$0.00	\$0.00
Maintenance Least Family Housing	727	\$3,258.81	\$1,438.09	\$7,778.46	\$2,553.35
Privatization	72811	\$1,033,745.40	\$1,013,192.11	\$1,011,481.75	\$1,102,862.81
Utilities for Government Dwellings	72812				
Utilities Other		\$4,504,663.46	\$4,349,783.80	\$5,082,151.82	\$3,932,192.54
Total Cost		\$4,606.00	\$4,447.63	\$5,196.47	\$4,020.65
Yearly cost per unit		\$383.83	\$370.64	\$433.04	\$335.05
Monthly cost per unit	978				
Number of Housing units	Multiplier	1.11	1.06	1.04	1.00
Adjusted for 2008		\$4,986,074.27	\$4,630,117.82	\$5,299,682.86	\$3,932,192.54
Total Yearly Cost		\$5,098.24	\$4,734.27	\$5,418.90	\$4,020.65
Yearly cost per unit		\$424.85	\$394.52	\$451.57	\$335.05
Monthly cost per unit	978				
Number of Housing units	\$401.50				

Appendix B Complete O&M Costs

Minot AFB		2005	2006	2007	2008
Management	72111	\$857,918.77	\$853,966.28	\$824,363.88	\$790,685.68
Services	72121	\$461,210.99	\$427,350.06	\$389,353.12	\$377,421.00
Furnishings	72141	\$30,763.95	\$10,970.40	\$10,000.00	\$21,960.75
Maintenance and Repair of Government Dwellings	72262	\$2,266,032.20	\$2,303,555.97	\$2,232,623.73	\$2,298,773.06
Self Help	72266	\$67,678.63	\$192,398.19	\$95,282.06	\$109,333.38
Maintenance and Repair of Utilities	72271	\$109,795.00	\$117,399.24	\$59,150.09	\$66,303.60
Maintenance and Repair of Other Real Property	72281	\$207,289.74	\$109,475.87	\$144,065.88	\$107,348.71
Major Repair of Government Housing	72296	\$2,269,068.12	\$267,655.55	\$1,503,821.58	\$8,273.34
Major Repair of Private Housing	72297	\$34.98	\$354,042.29	\$364,129.95	\$0.00
Operating Cost least Family Housing	725				
Maintenance Least Family Housing	726				
Privatization	727				
Utilities for Government Dwellings	72811	\$3,911,454.24	\$4,519,403.31	\$3,351,043.54	\$3,875,060.03
Utilities Other	72812				
Total Cost		\$10,181,246.62	\$9,156,217.16	\$8,973,833.83	\$7,655,159.55
Yearly cost per unit		\$7,129.72	\$6,411.92	\$6,284.20	\$5,360.76
Monthly cost per unit		\$594.14	\$534.33	\$523.68	\$446.73
Number of Housing units	1428				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost		\$11,269,310.63	\$9,746,315.27	\$9,357,940.31	\$7,655,159.55
Yearly cost per unit		\$7,891.67	\$6,825.15	\$6,553.18	\$5,360.76
Monthly cost per unit		\$657.64	\$568.76	\$546.10	\$446.73
Number of Housing units	1428				
Average Cost per unit	\$554.81				

Appendix B Complete O&M Costs

Mt. Home AFB		2005	2006	2007	2008
Management	72111	\$575,271.05	\$578,681.59	\$635,196.60	\$679,161.41
Services	72121	\$220,683.54	\$208,064.44	\$189,666.34	\$183,606.28
Furnishings	72141	\$157,334.15	\$49,725.18	\$59,620.42	\$19,381.47
Maintenance and Repair of Government Dwellings	72262	\$2,346,028.28	\$2,491,495.33	\$2,042,426.48	\$1,123,925.66
Self Help	72266	\$0.00	-\$652.31	\$0.00	
Maintenance and Repair of Utilities	72271	\$105,323.96	\$74,575.96	\$58,335.82	\$81,983.74
Maintenance and Repair of Other Real Property	72281	\$72,544.29	\$16,521.93	\$254,454.30	\$248,844.56
Major Repair of Government Housing	72296	\$204,422.19	\$40,663.50	\$49,403.39	\$34,519.94
Major Repair of Private Housing	72297	\$1,715,656.25	\$269,832.50	\$1,263,196.90	\$0.00
Operating Cost least Family Housing	725				
Maintenance Least Family Housing	726				
Privatization	727				
Utilities for Government Dwellings	72811	\$1,189,764.93	\$1,640,682.32	\$1,464,099.18	\$1,600,821.49
Utilities Other	72812				
Total Cost		\$6,587,028.64	\$5,369,590.44	\$6,016,399.43	\$3,972,244.55
Yearly cost per unit		\$4,769.75	\$3,888.19	\$4,356.55	\$2,876.35
Monthly cost per unit		\$397.48	\$324.02	\$363.05	\$239.70
Number of Housing units	1381				
Adjusted for 2008	Multiplier	1.11	1.06	1.04	1.00
Total Yearly Cost		\$7,290,980.63	\$5,715,648.76	\$6,273,919.02	\$3,972,244.55
Yearly cost per unit		\$5,279.49	\$4,138.78	\$4,543.03	\$2,876.35
Monthly cost per unit		\$439.96	\$344.90	\$378.59	\$239.70
Number of Housing units	1381				
Average Cost per unit	\$350.78				

Appendix C Average BAH Calculation

	Shaw AFB		
	Occupants	BAH	Total
Houses	1171		
Occupancy rate	94.00%		
Houses Occupied	1101		
0-6	11	\$1,688	\$19,053
0-5	41	\$1,674	\$67,883
0-4	36	\$1,527	\$55,538
0-3	64	\$1,317	\$84,789
0-2	20	\$1,128	\$23,107
0-1	17	\$925	\$15,468
E-9	11	\$1,377	\$14,967
E-8	16	\$1,274	\$20,772
E-7	78	\$1,200	\$93,812
E-6	157	\$1,133	\$178,095
E-5	276	\$898	\$247,773
E-4	179	\$856	\$153,162
E-3	174	\$856	\$148,868
E-2	15	\$856	\$12,883
E-1	5	\$856	\$3,936
Total	1101		\$1,140,106
Average Rent per Unit	\$1,035.76		

Appendix C Average BAH Calculation

	Cannon AFB		
	Occupants	BAH	Total
Houses	1303		
Occupancy rate	94.00%		
Houses Occupied	1225		
0-6	13	\$1,542	\$19,367
0-5	45	\$1,529	\$68,992
0-4	40	\$1,459	\$59,047
0-3	72	\$1,360	\$97,427
0-2	23	\$1,308	\$29,814
0-1	19	\$1,032	\$19,203
E-9	12	\$1,388	\$16,787
E-8	18	\$1,350	\$24,492
E-7	87	\$1,332	\$115,869
E-6	175	\$1,315	\$230,004
E-5	307	\$996	\$305,791
E-4	199	\$870	\$173,215
E-3	194	\$870	\$168,358
E-2	17	\$870	\$14,569
E-1	5	\$870	\$4,452
Total	1225		\$1,347,388
Average Rent per Unit	\$1,100.07		

Appendix C Average BAH Calculation

	Edwards AFB		
	Occupants	BAH	Total
Houses	1211		
Occupancy rate	94.00%		
Houses Occupied	1138		
0-6	12	\$2,270	\$26,498
0-5	42	\$2,252	\$94,441
0-4	38	\$2,111	\$79,401
0-3	67	\$1,907	\$126,967
0-2	21	\$1,618	\$34,276
0-1	17	\$1,432	\$24,764
E-9	11	\$1,966	\$22,099
E-8	17	\$1,841	\$31,041
E-7	81	\$1,727	\$139,622
E-6	163	\$1,622	\$263,669
E-5	285	\$1,408	\$401,761
E-4	185	\$1,310	\$242,402
E-3	180	\$1,310	\$235,606
E-2	16	\$1,310	\$20,389
E-1	5	\$1,310	\$6,230
Total	1138		\$1,749,169
Average Rent per Unit	\$1,536.60		

Appendix C Average BAH Calculation

	McConnell AFB		
	Occupants	BAH	Total
Houses	493		
Occupancy rate	94.00%		
Houses Occupied	463		
0-6	5	\$1,704	\$8,098
0-5	17	\$1,690	\$28,852
0-4	15	\$1,518	\$23,244
0-3	27	\$1,275	\$34,558
0-2	9	\$1,172	\$10,108
0-1	7	\$1,022	\$7,195
E-9	5	\$1,343	\$6,146
E-8	7	\$1,252	\$8,594
E-7	33	\$1,212	\$39,890
E-6	66	\$1,176	\$77,825
E-5	116	\$1,002	\$116,395
E-4	75	\$864	\$65,085
E-3	73	\$864	\$63,260
E-2	6	\$864	\$5,474
E-1	2	\$864	\$1,673
Total	463		\$496,398
Average Rent per Unit	\$1,071.16		

Appendix C Average BAH Calculation

	Malmstrom AFB		
	Occupants	BAH	Total
Houses	1192		
Occupancy rate	94.00%		
Houses Occupied	1120		
0-6	11	\$1,417	\$16,281
0-5	41	\$1,405	\$57,996
0-4	37	\$1,323	\$48,982
0-3	66	\$1,205	\$78,970
0-2	21	\$1,066	\$22,228
0-1	17	\$915	\$15,575
E-9	11	\$1,239	\$13,709
E-8	17	\$1,173	\$19,468
E-7	80	\$1,119	\$89,048
E-6	160	\$1,070	\$171,208
E-5	281	\$895	\$251,374
E-4	182	\$773	\$140,792
E-3	177	\$773	\$136,844
E-2	15	\$773	\$11,842
E-1	5	\$773	\$3,618
Total	1120		\$1,077,936
Average Rent per Unit	\$962.03		

Appendix C Average BAH Calculation

	McChord AFB		
	Occupants	BAH	Total
Houses	978		
Occupancy rate	94.00%		
Houses Occupied	919		
0-6	9	\$2,226	\$20,985
0-5	34	\$2,208	\$74,780
0-4	30	\$2,159	\$65,582
0-3	54	\$2,082	\$111,948
0-2	17	\$1,623	\$27,767
0-1	14	\$1,437	\$20,069
E-9	9	\$2,109	\$19,145
E-8	14	\$1,977	\$26,921
E-7	65	\$1,794	\$117,133
E-6	131	\$1,628	\$213,726
E-5	230	\$1,412	\$325,383
E-4	149	\$1,270	\$189,786
E-3	145	\$1,270	\$184,465
E-2	13	\$1,270	\$15,963
E-1	4	\$1,270	\$4,878
Total	919		\$1,418,532
Average Rent per Unit	\$1,543.02		

Appendix C Average BAH Calculation

	Minot AFB		
	Occupants	BAH	Total
Houses	1428		
Occupancy rate	94.00%		
Houses Occupied	1342		
0-6	14	\$1,602	\$22,051
0-5	49	\$1,589	\$78,578
0-4	44	\$1,539	\$68,259
0-3	79	\$1,465	\$115,017
0-2	25	\$1,293	\$32,300
0-1	20	\$949	\$19,352
E-9	13	\$1,487	\$19,710
E-8	20	\$1,427	\$28,372
E-7	95	\$1,362	\$129,845
E-6	192	\$1,302	\$249,577
E-5	336	\$904	\$304,171
E-4	218	\$810	\$176,740
E-3	212	\$810	\$171,784
E-2	18	\$810	\$14,866
E-1	6	\$810	\$4,542
Total	1342		\$1,435,165
Average Rent per Unit	\$1,069.17		

Appendix C Average BAH Calculation

	Mountain Home AFB		
	Occupants	BAH	Total
Houses	1381		
Occupancy rate	94.00%		
Houses Occupied	1298		
0-6	13	\$1,515	\$20,167
0-5	48	\$1,503	\$71,879
0-4	43	\$1,430	\$61,337
0-3	76	\$1,323	\$100,450
0-2	24	\$1,125	\$27,178
0-1	20	\$1,007	\$19,859
E-9	13	\$1,355	\$17,369
E-8	19	\$1,278	\$24,573
E-7	92	\$1,199	\$110,543
E-6	185	\$1,128	\$209,107
E-5	325	\$991	\$322,469
E-4	211	\$898	\$189,492
E-3	205	\$898	\$184,179
E-2	18	\$898	\$15,939
E-1	5	\$898	\$4,870
Total	1298		\$1,379,413
Average Rent per Unit	\$1,062.61		

Appendix D NPV Calculation

Shaw AFB	
Location Adjustment	0.75
Conveyed Units	735
Units to Demo	732
Units to Update	0
Unchanged Units (Original)	3
New Construction	784
End State Inventory	787
30 year Treasury Rate	2.87%
O&M Cost per unit	\$565.05
Average BAH Payment	\$1,035.76
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$146,151.60
Garage Cost	\$13,350.00
Total Construction Cost per unit	\$159,501.60
Cost of Renovation per unit	\$73,075.80
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$125,049,254.40
Total cost of renovation project	\$0.00
Total cost of demolition	\$5,949,696.00

Financial Data	
Annual O&M Cost	\$5,336,332.20
Units Occupied	740
Annual Revenue	\$9,194,844.47

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x national average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

Shaw AFB - 50 years				
NPV @	1.87%	(\$44,124,049.18)		
NPV @	2.87%	(\$58,827,563.73)		
NPV @	3.87%	(\$69,520,641.45)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$130,998,950.40	
Year 1	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 2	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 3	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 4	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 5	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 6	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 7	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 8	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 9	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 10	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 11	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 12	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 13	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 14	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 15	\$9,154,688.73	\$5,336,332.20	\$219,227.40	\$3,599,129.13
Year 16	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 17	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 18	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 19	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 20	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 21	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 22	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 23	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 24	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 25	\$9,154,688.73	\$5,336,332.20	\$57,291,427.20	-\$53,473,070.67
Year 26	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 27	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 28	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 29	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 30	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 31	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 32	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 33	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 34	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 35	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 36	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 37	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 38	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 39	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 40	\$9,154,688.73	\$5,336,332.20	\$502,888.80	\$3,315,467.73
Year 41	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 42	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 43	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 44	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 45	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 46	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 47	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 48	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 49	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 50	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53

Appendix D NPV Calculation

Shaw AFB - 60 Years				
NPV @	1.87%	(\$39,616,085.80)		
NPV @	2.87%	(\$54,021,306.62)		
NPV @	3.87%	(\$64,785,228.91)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$130,998,950.40	
Year 1	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 2	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 3	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 4	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 5	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 6	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 7	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 8	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 9	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 10	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 11	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 12	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 13	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 14	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 15	\$9,194,844.47	\$5,336,332.20	\$219,227.40	\$3,639,284.87
Year 16	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 17	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 18	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 19	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 20	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 21	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 22	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 23	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 24	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 25	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 26	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 27	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 28	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 29	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 30	\$9,194,844.47	\$5,336,332.20	\$57,291,427.20	-\$53,432,914.93
Year 31	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 32	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 33	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 34	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 35	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 36	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 37	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 38	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 39	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 40	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 41	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 42	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 43	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 44	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 45	\$9,194,844.47	\$5,336,332.20	\$502,888.80	\$3,355,623.47
Year 46	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 47	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 48	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 49	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27
Year 50	\$9,194,844.47	\$5,336,332.20	0	\$3,858,512.27

Appendix D NPV Calculation

Shaw AFB - 70 year				
NPV @	1.87%	(\$37,787,130.48)		
NPV @	2.87%	(\$51,705,586.14)		
NPV @	3.87%	(\$62,405,148.59)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$130,998,950.40	
Year 1	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 2	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 3	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 4	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 5	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 6	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 7	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 8	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 9	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 10	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 11	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 12	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 13	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 14	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 15	\$9,154,688.73	\$5,336,332.20	\$219,227.40	\$3,599,129.13
Year 16	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 17	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 18	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 19	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 20	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 21	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 22	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 23	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 24	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 25	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 26	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 27	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 28	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 29	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 30	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 31	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 32	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 33	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 34	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 35	\$9,154,688.73	\$5,336,332.20	\$57,291,427.20	-\$53,473,070.67
Year 36	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 37	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 38	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 39	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 40	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 41	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 42	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 43	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 44	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 45	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 46	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 47	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 48	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 49	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53
Year 50	\$9,154,688.73	\$5,336,332.20	0	\$3,818,356.53

Appendix D NPV Calculation

Cannon AFB	
Location Adjustment	0.83
Conveyed Units	886
Units to Demo	274
Units to Update	349
Unchanged Units (Original)	263
New Construction	422
End State Inventory	1034
30 year Treasury Rate	2.87%
O&M Cost per unit	\$480.78
Average BAH Payment	\$1,100.07
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$161,741.10
Garage Cost	\$14,774.00
Total Construction Cost per unit	\$176,515.10
Cost of Renovation per unit	\$80,870.55
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$74,489,373.89
Total cost of renovation project	\$28,223,822.65
Total cost of demolition	\$2,227,072.00

Financial Data	
Annual O&M Cost	\$5,965,518.24
Units Occupied	972
Annual Revenue	\$12,830,687.07

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

Cannon AFB - 50 years				
NPV @	1.87%	\$13,977,403.75		
NPV @	2.87%	(\$3,278,624.74)		
NPV @	3.87%	(\$15,987,534.72)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$104,940,268.54	
Year 1	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 2	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 3	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 4	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 5	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 6	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 7	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 8	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 9	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 10	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 11	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 12	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 13	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 14	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 15	\$12,782,751.38	\$5,965,518.24	\$21,268,955.18	-\$14,451,722.04
Year 16	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 17	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 18	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 19	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 20	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 21	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 22	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 23	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 24	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 25	\$12,782,751.38	\$5,965,518.24	\$98,567,816.24	-\$91,750,583.10
Year 26	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 27	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 28	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 29	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 30	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 31	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 32	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 33	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 34	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 35	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 36	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 37	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 38	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 39	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 40	\$12,782,751.38	\$5,965,518.24	\$48,561,136.35	-\$41,743,903.21
Year 41	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 42	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 43	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 44	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 45	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 46	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 47	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 48	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 49	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 50	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14

Appendix D NPV Calculation

Cannon AFB - 60 Years				
NPV @	1.87%	\$23,061,200.11		
NPV @	2.87%	\$6,461,388.86		
NPV @	3.87%	(\$6,499,116.30)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$104,940,268.54	
Year 1	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 2	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 3	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 4	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 5	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 6	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 7	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 8	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 9	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 10	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 11	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 12	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 13	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 14	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 15	\$12,830,687.07	\$5,965,518.24	\$21,268,955.18	-\$14,403,786.34
Year 16	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 17	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 18	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 19	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 20	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 21	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 22	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 23	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 24	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 25	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 26	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 27	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 28	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 29	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 30	\$12,830,687.07	\$5,965,518.24	\$98,567,816.24	-\$91,702,647.41
Year 31	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 32	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 33	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 34	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 35	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 36	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 37	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 38	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 39	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 40	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 41	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 42	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 43	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 44	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 45	\$12,830,687.07	\$5,965,518.24	\$48,561,136.35	-\$41,695,967.52
Year 46	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 47	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 48	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 49	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83
Year 50	\$12,830,687.07	\$5,965,518.24	0	\$6,865,168.83

Appendix D NPV Calculation

Cannon AFB - 70 year				
NPV @	1.87%	\$47,611,395.27		
NPV @	2.87%	\$24,353,608.62		
NPV @	3.87%	\$6,698,633.94		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$104,940,268.54	
Year 1	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 2	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 3	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 4	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 5	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 6	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 7	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 8	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 9	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 10	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 11	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 12	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 13	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 14	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 15	\$12,782,751.38	\$5,965,518.24	\$21,268,955.18	-\$14,451,722.04
Year 16	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 17	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 18	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 19	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 20	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 21	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 22	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 23	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 24	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 25	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 26	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 27	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 28	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 29	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 30	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 31	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 32	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 33	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 34	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 35	\$12,782,751.38	\$5,965,518.24	\$98,567,816.24	-\$91,750,583.10
Year 36	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 37	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 38	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 39	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 40	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 41	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 42	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 43	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 44	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 45	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 46	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 47	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 48	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 49	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14
Year 50	\$12,782,751.38	\$5,965,518.24	0	\$6,817,233.14

Appendix D NPV Calculation

Edwards AFB	
Location Adjustment	1
Conveyed Units	1002
Units to Demo	206
Units to Update	0
Unchanged Units (Original)	796
New Construction	0
End State Inventory	796
30 year Treasury Rate	2.87%
O&M Cost per unit	\$803.89
Average BAH Payment	\$1,536.60
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$194,868.80
Garage Cost	\$17,800.00
Total Construction Cost per unit	\$212,668.80
Cost of Renovation per unit	\$97,434.40
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$0.00
Total cost of renovation project	\$0.00
Total cost of demolition	\$1,674,368.00

Financial Data	
Annual O&M Cost	\$7,678,757.28
Units Occupied	748
Annual Revenue	\$13,796,910.18

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

Edwards AFB - 50 Years				
NPV @	1.87%	\$51,894,386.59		
NPV @	2.87%	\$51,039,864.72		
NPV @	3.87%	\$49,319,219.12		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$1,674,368.00	
Year 1	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 2	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 3	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 4	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 5	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 6	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 7	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 8	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 9	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 10	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 11	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 12	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 13	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 14	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 15	\$13,749,089.58	\$7,678,757.28	\$77,557,782.40	-\$71,487,450.10
Year 16	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 17	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 18	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 19	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 20	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 21	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 22	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 23	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 24	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 25	\$13,749,089.58	\$7,678,757.28	\$0.00	\$6,070,332.30
Year 26	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 27	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 28	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 29	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 30	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 31	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 32	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 33	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 34	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 35	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 36	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 37	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 38	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 39	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 40	\$13,749,089.58	\$7,678,757.28	\$175,754,252.80	-\$169,683,920.50
Year 41	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 42	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 43	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 44	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 45	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 46	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 47	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 48	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 49	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 50	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30

Appendix D NPV Calculation

Edwards AFB - 60 Years				
NPV @	1.87%	\$60,849,966.00		
NPV @	2.87%	\$59,777,585.31		
NPV @	3.87%	\$57,024,629.22		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$1,674,368.00	
Year 1	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 2	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 3	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 4	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 5	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 6	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 7	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 8	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 9	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 10	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 11	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 12	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 13	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 14	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 15	\$13,796,910.18	\$7,678,757.28	\$77,557,782.40	-\$71,439,629.50
Year 16	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 17	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 18	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 19	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 20	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 21	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 22	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 23	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 24	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 25	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 26	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 27	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 28	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 29	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 30	\$13,796,910.18	\$7,678,757.28	\$0.00	\$6,118,152.90
Year 31	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 32	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 33	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 34	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 35	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 36	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 37	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 38	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 39	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 40	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 41	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 42	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 43	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 44	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 45	\$13,796,910.18	\$7,678,757.28	\$175,754,252.80	-\$169,636,099.90
Year 46	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 47	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 48	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 49	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90
Year 50	\$13,796,910.18	\$7,678,757.28	0	\$6,118,152.90

Appendix D NPV Calculation

Edwards AFB - 70 Years				
NPV @	1.87%	\$135,657,651.39		
NPV @	2.87%	\$107,710,260.96		
NPV @	3.87%	\$87,805,024.36		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$1,674,368.00	
Year 1	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 2	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 3	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 4	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 5	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 6	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 7	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 8	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 9	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 10	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 11	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 12	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 13	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 14	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 15	\$13,749,089.58	\$7,678,757.28	\$77,557,782.40	-\$71,487,450.10
Year 16	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 17	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 18	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 19	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 20	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 21	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 22	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 23	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 24	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 25	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 26	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 27	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 28	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 29	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 30	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 31	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 32	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 33	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 34	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 35	\$13,749,089.58	\$7,678,757.28	\$0.00	\$6,070,332.30
Year 36	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 37	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 38	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 39	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 40	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 41	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 42	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 43	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 44	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 45	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 46	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 47	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 48	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 49	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30
Year 50	\$13,749,089.58	\$7,678,757.28	0	\$6,070,332.30

Appendix D NPV Calculation

McConnell AFB	
Location Adjustment	0.81
Conveyed Units	493
Units to Demo	124
Units to Update	50
Unchanged Units (Original)	319
New Construction	72
End State Inventory	441
30 year Treasury Rate	2.87%
O&M Cost per unit	\$887.90
Average BAH Payment	\$1,071.16
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$157,843.73
Garage Cost	\$14,418.00
Total Construction Cost per unit	\$172,261.73
Cost of Renovation per unit	\$78,921.86
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$12,402,844.42
Total cost of renovation project	\$3,946,093.20
Total cost of demolition	\$1,007,872.00

Financial Data	
Annual O&M Cost	\$4,698,766.80
Units Occupied	415
Annual Revenue	\$5,328,478.58

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

McConnell AFB - 50 years				
NPV @	1.87%	(\$53,366,011.12)		
NPV @	2.87%	(\$43,510,741.65)		
NPV @	3.87%	(\$36,468,801.71)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$17,356,809.62	
Year 1	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 2	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 3	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 4	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 5	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 6	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 7	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 8	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 9	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 10	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 11	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 12	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 13	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 14	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 15	\$5,309,759.95	\$4,698,766.80	\$25,176,074.62	-\$24,565,081.46
Year 16	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 17	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 18	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 19	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 20	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 21	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 22	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 23	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 24	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 25	\$5,309,759.95	\$4,698,766.80	\$14,701,860.61	-\$14,090,867.46
Year 26	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 27	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 28	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 29	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 30	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 31	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 32	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 33	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 34	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 35	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 36	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 37	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 38	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 39	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 40	\$5,309,759.95	\$4,698,766.80	\$57,544,323.23	-\$56,933,330.08
Year 41	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 42	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 43	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 44	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 45	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 46	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 47	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 48	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 49	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 50	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15

Appendix D NPV Calculation

McConnell AFB - 60 Years				
NPV @	1.87%	(\$49,516,412.77)		
NPV @	2.87%	(\$39,613,075.05)		
NPV @	3.87%	(\$32,894,776.79)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$17,356,809.62	
Year 1	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 2	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 3	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 4	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 5	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 6	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 7	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 8	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 9	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 10	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 11	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 12	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 13	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 14	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 15	\$5,328,478.58	\$4,698,766.80	\$25,176,074.62	-\$24,546,362.83
Year 16	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 17	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 18	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 19	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 20	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 21	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 22	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 23	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 24	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 25	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 26	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 27	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 28	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 29	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 30	\$5,328,478.58	\$4,698,766.80	\$14,701,860.61	-\$14,072,148.83
Year 31	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 32	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 33	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 34	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 35	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 36	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 37	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 38	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 39	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 40	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 41	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 42	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 43	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 44	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 45	\$5,328,478.58	\$4,698,766.80	\$57,544,323.23	-\$56,914,611.45
Year 46	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 47	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 48	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 49	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78
Year 50	\$5,328,478.58	\$4,698,766.80	0	\$629,711.78

Appendix D NPV Calculation

McConnell AFB - 70 year				
NPV @	1.87%	(\$24,376,136.67)		
NPV @	2.87%	(\$23,170,088.04)		
NPV @	3.87%	(\$22,070,341.43)		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$17,356,809.62	
Year 1	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 2	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 3	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 4	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 5	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 6	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 7	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 8	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 9	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 10	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 11	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 12	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 13	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 14	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 15	\$5,309,759.95	\$4,698,766.80	\$25,176,074.62	-\$24,565,081.46
Year 16	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 17	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 18	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 19	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 20	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 21	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 22	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 23	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 24	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 25	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 26	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 27	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 28	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 29	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 30	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 31	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 32	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 33	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 34	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 35	\$5,309,759.95	\$4,698,766.80	\$14,701,860.61	-\$14,090,867.46
Year 36	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 37	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 38	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 39	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 40	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 41	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 42	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 43	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 44	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 45	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 46	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 47	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 48	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 49	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15
Year 50	\$5,309,759.95	\$4,698,766.80	0	\$610,993.15

Appendix D NPV Calculation

Malmstrom AFB	
Location Adjustment	0.84
Conveyed Units	932
Units to Demo	90
Units to Update	179
Unchanged Units (Original)	663
New Construction	0
End State Inventory	842
30 year Treasury Rate	2.87%
O&M Cost per unit	\$446.30
Average BAH Payment	\$962.03
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$163,689.79
Garage Cost	\$14,952.00
Total Construction Cost per unit	\$178,641.79
Cost of Renovation per unit	\$81,844.90
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$0.00
Total cost of renovation project	\$14,650,236.38
Total cost of demolition	\$731,520.00

Financial Data	
Annual O&M Cost	\$4,509,415.20
Units Occupied	791
Annual Revenue	\$9,137,133.70

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

Malmstrom AFB - 50 years				
NPV @	1.87%	\$11,850,529.44		
NPV @	2.87%	\$13,889,998.78		
NPV @	3.87%	\$14,786,868.57		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$15,381,756.38	
Year 1	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 2	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 3	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 4	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 5	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 6	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 7	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 8	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 9	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 10	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 11	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 12	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 13	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 14	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 15	\$9,103,318.03	\$4,509,415.20	\$54,263,166.05	-\$49,669,263.22
Year 16	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 17	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 18	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 19	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 20	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 21	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 22	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 23	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 24	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 25	\$9,103,318.03	\$4,509,415.20	\$33,431,792.77	-\$28,837,889.94
Year 26	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 27	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 28	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 29	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 30	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 31	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 32	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 33	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 34	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 35	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 36	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 37	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 38	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 39	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 40	\$9,103,318.03	\$4,509,415.20	\$123,828,372.10	-\$119,234,469.27
Year 41	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 42	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 43	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 44	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 45	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 46	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 47	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 48	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 49	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 50	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83

Appendix D NPV Calculation

Malmstrom AFB - 60 Years				
NPV @	1.87%	\$20,025,539.03		
NPV @	2.87%	\$22,223,527.04		
NPV @	3.87%	\$22,455,855.20		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$15,381,756.38	
Year 1	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 2	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 3	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 4	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 5	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 6	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 7	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 8	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 9	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 10	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 11	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 12	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 13	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 14	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 15	\$9,137,133.70	\$4,509,415.20	\$54,263,166.05	-\$49,635,447.55
Year 16	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 17	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 18	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 19	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 20	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 21	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 22	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 23	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 24	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 25	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 26	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 27	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 28	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 29	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 30	\$9,137,133.70	\$4,509,415.20	\$33,431,792.77	-\$28,804,074.27
Year 31	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 32	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 33	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 34	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 35	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 36	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 37	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 38	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 39	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 40	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 41	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 42	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 43	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 44	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 45	\$9,137,133.70	\$4,509,415.20	\$123,828,372.10	-\$119,200,653.60
Year 46	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 47	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 48	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 49	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50
Year 50	\$9,137,133.70	\$4,509,415.20	0	\$4,627,718.50

Appendix D NPV Calculation

Malmstrom AFB - 70 year				
NPV @	1.87%	\$74,424,259.19		
NPV @	2.87%	\$57,878,687.39		
NPV @	3.87%	\$45,990,108.35		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$15,381,756.38	
Year 1	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 2	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 3	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 4	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 5	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 6	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 7	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 8	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 9	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 10	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 11	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 12	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 13	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 14	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 15	\$9,103,318.03	\$4,509,415.20	\$54,263,166.05	-\$49,669,263.22
Year 16	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 17	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 18	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 19	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 20	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 21	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 22	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 23	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 24	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 25	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 26	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 27	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 28	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 29	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 30	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 31	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 32	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 33	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 34	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 35	\$9,103,318.03	\$4,509,415.20	\$33,431,792.77	-\$28,837,889.94
Year 36	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 37	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 38	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 39	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 40	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 41	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 42	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 43	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 44	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 45	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 46	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 47	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 48	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 49	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83
Year 50	\$9,103,318.03	\$4,509,415.20	0	\$4,593,902.83

Appendix D NPV Calculation

McChord AFB	
Location Adjustment	0.94
Conveyed Units	978
Units to Demo	620
Units to Update	268
Unchanged Units (Original)	90
New Construction	250
End State Inventory	608
30 year Treasury Rate	2.87%
O&M Cost per unit	\$401.50
Average BAH Payment	\$1,543.02
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$183,176.67
Garage Cost	\$16,732.00
Total Construction Cost per unit	\$199,908.67
Cost of Renovation per unit	\$91,588.34
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$49,977,168.00
Total cost of renovation project	\$24,545,674.05
Total cost of demolition	\$5,039,360.00

Financial Data	
Annual O&M Cost	\$2,929,344.00
Units Occupied	572
Annual Revenue	\$10,582,420.60

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

McChord AFB - 50 years				
NPV @	1.87%	\$101,547,412.11		
NPV @	2.87%	\$70,942,208.88		
NPV @	3.87%	\$48,396,160.78		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$79,562,202.05	
Year 1	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 2	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 3	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 4	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 5	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 6	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 7	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 8	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 9	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 10	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 11	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 12	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 13	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 14	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 15	\$10,538,303.00	\$2,929,344.00	\$8,242,950.24	-\$633,991.24
Year 16	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 17	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 18	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 19	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 20	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 21	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 22	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 23	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 24	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 25	\$10,538,303.00	\$2,929,344.00	\$78,650,912.10	-\$71,041,953.09
Year 26	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 27	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 28	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 29	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 30	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 31	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 32	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 33	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 34	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 35	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 36	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 37	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 38	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 39	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 40	\$10,538,303.00	\$2,929,344.00	\$18,723,300.48	-\$11,114,341.48
Year 41	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 42	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 43	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 44	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 45	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 46	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 47	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 48	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 49	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 50	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00

Appendix D NPV Calculation

McChord AFB - 60 Years				
NPV @	1.87%	\$108,140,837.87		
NPV @	2.87%	\$78,017,051.17		
NPV @	3.87%	\$55,337,983.80		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$79,562,202.05	
Year 1	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 2	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 3	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 4	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 5	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 6	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 7	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 8	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 9	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 10	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 11	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 12	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 13	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 14	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 15	\$10,582,420.60	\$2,929,344.00	\$8,242,950.24	-\$589,873.64
Year 16	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 17	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 18	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 19	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 20	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 21	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 22	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 23	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 24	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 25	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 26	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 27	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 28	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 29	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 30	\$10,582,420.60	\$2,929,344.00	\$78,650,912.10	-\$70,997,835.49
Year 31	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 32	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 33	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 34	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 35	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 36	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 37	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 38	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 39	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 40	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 41	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 42	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 43	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 44	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 45	\$10,582,420.60	\$2,929,344.00	\$18,723,300.48	-\$11,070,223.88
Year 46	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 47	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 48	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 49	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60
Year 50	\$10,582,420.60	\$2,929,344.00	0	\$7,653,076.60

Appendix D NPV Calculation

McChord AFB - 70 year				
NPV @	1.87%	\$118,841,238.49		
NPV @	2.87%	\$86,533,969.93		
NPV @	3.87%	\$62,113,224.81		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$79,562,202.05	
Year 1	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 2	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 3	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 4	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 5	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 6	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 7	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 8	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 9	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 10	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 11	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 12	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 13	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 14	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 15	\$10,538,303.00	\$2,929,344.00	\$8,242,950.24	-\$633,991.24
Year 16	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 17	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 18	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 19	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 20	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 21	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 22	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 23	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 24	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 25	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 26	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 27	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 28	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 29	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 30	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 31	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 32	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 33	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 34	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 35	\$10,538,303.00	\$2,929,344.00	\$78,650,912.10	-\$71,041,953.09
Year 36	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 37	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 38	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 39	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 40	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 41	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 42	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 43	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 44	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 45	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 46	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 47	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 48	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 49	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00
Year 50	\$10,538,303.00	\$2,929,344.00	0	\$7,608,959.00

Appendix D NPV Calculation

Minot AFB	
Location Adjustment	0.81
Conveyed Units	1226
Units to Demo	110
Units to Update	30
Unchanged Units (Original)	1086
New Construction	110
End State Inventory	1226
30 year Treasury Rate	2.87%
O&M Cost per unit	\$554.81
Average BAH Payment	\$1,069.17
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$157,843.73
Garage Cost	\$14,418.00
Total Construction Cost per unit	\$172,261.73
Cost of Renovation per unit	\$78,921.86
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$18,948,790.08
Total cost of renovation project	\$2,367,655.92
Total cost of demolition	\$894,080.00

Financial Data	
Annual O&M Cost	\$8,162,364.72
Units Occupied	1152
Annual Revenue	\$14,785,816.58

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

Minot AFB - 50 years				
NPV @	1.87%	\$22,092,160.32		
NPV @	2.87%	\$24,286,709.00		
NPV @	3.87%	\$24,764,642.73		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$22,210,526.00	
Year 1	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 2	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 3	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 4	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 5	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 6	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 7	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 8	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 9	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 10	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 11	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 12	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 13	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 14	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 15	\$14,708,822.21	\$8,162,364.72	\$85,709,144.30	-\$79,162,686.82
Year 16	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 17	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 18	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 19	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 20	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 21	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 22	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 23	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 24	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 25	\$14,708,822.21	\$8,162,364.72	\$14,093,096.88	-\$7,546,639.39
Year 26	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 27	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 28	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 29	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 30	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 31	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 32	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 33	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 34	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 35	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 36	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 37	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 38	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 39	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 40	\$14,708,822.21	\$8,162,364.72	\$195,903,244.61	-\$189,356,787.12
Year 41	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 42	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 43	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 44	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 45	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 46	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 47	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 48	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 49	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 50	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49

Appendix D NPV Calculation

Minot AFB - 60 Years				
NPV @	1.87%	\$33,624,308.32		
NPV @	2.87%	\$35,567,537.92		
NPV @	3.87%	\$34,817,075.02		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$22,210,526.00	
Year 1	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 2	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 3	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 4	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 5	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 6	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 7	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 8	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 9	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 10	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 11	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 12	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 13	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 14	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 15	\$14,785,816.58	\$8,162,364.72	\$85,709,144.30	-\$79,085,692.44
Year 16	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 17	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 18	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 19	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 20	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 21	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 22	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 23	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 24	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 25	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 26	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 27	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 28	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 29	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 30	\$14,785,816.58	\$8,162,364.72	\$14,093,096.88	-\$7,469,645.02
Year 31	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 32	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 33	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 34	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 35	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 36	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 37	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 38	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 39	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 40	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 41	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 42	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 43	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 44	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 45	\$14,785,816.58	\$8,162,364.72	\$195,903,244.61	-\$189,279,792.75
Year 46	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 47	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 48	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 49	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86
Year 50	\$14,785,816.58	\$8,162,364.72	0	\$6,623,451.86

Appendix D NPV Calculation

Minot AFB - 70 year				
NPV @	1.87%	\$116,958,154.78		
NPV @	2.87%	\$89,166,013.41		
NPV @	3.87%	\$69,385,824.52		
Revenue stream	Income	O&M Expense	Outlay	Net Revenue
Start of the project			\$22,210,526.00	
Year 1	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 2	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 3	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 4	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 5	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 6	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 7	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 8	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 9	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 10	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 11	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 12	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 13	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 14	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 15	\$14,708,822.21	\$8,162,364.72	\$85,709,144.30	-\$79,162,686.82
Year 16	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 17	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 18	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 19	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 20	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 21	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 22	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 23	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 24	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 25	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 26	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 27	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 28	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 29	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 30	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 31	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 32	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 33	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 34	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 35	\$14,708,822.21	\$8,162,364.72	\$14,093,096.88	-\$7,546,639.39
Year 36	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 37	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 38	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 39	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 40	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 41	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 42	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 43	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 44	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 45	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 46	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 47	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 48	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 49	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49
Year 50	\$14,708,822.21	\$8,162,364.72	0	\$6,546,457.49

Appendix D NPV Calculation

Mt. Home AFB	
Location Adjustment	0.85
Conveyed Units	1319
Units to Demo	475
Units to Update	0
Unchanged Units (Original)	844
New Construction	480
End State Inventory	1324
30 year Treasury Rate	2.87%
O&M Cost per unit	\$350.78
Average BAH Payment	\$1,062.61
Occupancy Rate	94.00%
Cost per square foot	\$95.90
Garage cost per square foot	\$44.50
Garage square feet (2 car garage 20'x20')	400
Renovation Percentage	50.00%
Average square feet per unit	2032
Cost per Unit - Living Area	\$165,638.48
Garage Cost	\$15,130.00
Total Construction Cost per unit	\$180,768.48
Cost of Renovation per unit	\$82,819.24
Cost of Demolition per unit	\$8,128.00

Project Costs	
Total cost of new construction	\$86,768,870.40
Total cost of renovation project	\$0.00
Total cost of demolition	\$3,860,800.00

Financial Data	
Annual O&M Cost	\$5,573,192.64
Units Occupied	1245
Annual Revenue	\$15,869,736.70

Assumptions
New units have an economic life of 50, 60 or 70 year. Results are attached.
Updating costs equal 50% of the cost to construct new units minus the cost of the garage.
Existing units will need to be renovated after 15 years of the start of the project.
Remodels will be sufficient for half of the original economic life.
Demolition costs equal \$8,128 (\$5 square foot x notational average square feet of 2,032) per national demolition association.

Appendix D NPV Calculation

Mt. Home AFB - 50 years				
NPV @	1.87%	\$86,299,646.72		
NPV @	2.87%	\$62,840,997.43		
NPV @	3.87%	\$44,568,548.79		
Revenue stream	Income		Outlay	
Start of the project		O&M Expense	\$90,629,670.40	Net Revenue
Year 1	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 2	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 3	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 4	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 5	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 6	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 7	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 8	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 9	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 10	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 11	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 12	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 13	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 14	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 15	\$15,816,764.56	\$5,573,192.64	\$69,899,438.56	-\$59,655,866.64
Year 16	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 17	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 18	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 19	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 20	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 21	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 22	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 23	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 24	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 25	\$15,816,764.56	\$5,573,192.64	\$39,753,235.20	-\$29,509,663.28
Year 26	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 27	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 28	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 29	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 30	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 31	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 32	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 33	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 34	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 35	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 36	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 37	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 38	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 39	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 40	\$15,816,764.56	\$5,573,192.64	\$159,428,629.12	-\$149,185,057.20
Year 41	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 42	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 43	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 44	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 45	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 46	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 47	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 48	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 49	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 50	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92

Appendix D NPV Calculation

Mt. Home AFB - 60 Years				
NPV @	1.87%	\$96,946,504.38		
NPV @	2.87%	\$73,605,290.31		
NPV @	3.87%	\$54,429,427.35		
Revenue stream	Income		Outlay	
Start of the project		O&M Expense	\$90,629,670.40	Net Revenue
Year 1	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 2	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 3	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 4	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 5	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 6	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 7	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 8	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 9	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 10	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 11	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 12	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 13	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 14	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 15	\$15,869,736.70	\$5,573,192.64	\$69,899,438.56	-\$59,602,894.50
Year 16	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 17	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 18	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 19	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 20	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 21	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 22	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 23	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 24	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 25	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 26	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 27	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 28	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 29	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 30	\$15,869,736.70	\$5,573,192.64	\$39,753,235.20	-\$29,456,691.14
Year 31	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 32	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 33	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 34	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 35	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 36	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 37	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 38	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 39	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 40	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 41	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 42	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 43	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 44	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 45	\$15,869,736.70	\$5,573,192.64	\$159,428,629.12	-\$149,132,085.06
Year 46	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 47	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 48	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 49	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06
Year 50	\$15,869,736.70	\$5,573,192.64	0	\$10,296,544.06

Appendix D NPV Calculation

Mt. Home AFB - 70 year				
NPV @	1.87%	\$166,512,973.54		
NPV @	2.87%	\$119,076,608.18		
NPV @	3.87%	\$84,340,319.82		
Revenue stream	Income		Outlay	
Start of the project		O&M Expense	\$90,629,670.40	Net Revenue
Year 1	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 2	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 3	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 4	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 5	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 6	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 7	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 8	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 9	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 10	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 11	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 12	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 13	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 14	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 15	\$15,816,764.56	\$5,573,192.64	\$69,899,438.56	-\$59,655,866.64
Year 16	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 17	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 18	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 19	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 20	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 21	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 22	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 23	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 24	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 25	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 26	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 27	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 28	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 29	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 30	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 31	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 32	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 33	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 34	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 35	\$15,816,764.56	\$5,573,192.64	\$39,753,235.20	-\$29,509,663.28
Year 36	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 37	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 38	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 39	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 40	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 41	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 42	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 43	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 44	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 45	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 46	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 47	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 48	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 49	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92
Year 50	\$15,816,764.56	\$5,573,192.64	0	\$10,243,571.92

Bibliography

- AFMAN 65-604, Appropriation Symbols and Budget Codes, (1 October 2008).
- Air Force Smart Operations for the 21st Century (AFSO21). Available on line:
<http://www.acc.af.mil/shared/media/document/AFD-070807-043.pdf>, (30 June 2006).
- Baldwin, W.C., *Four Housing Privatization Programs*. Alexandria, VA: Headquarters U.S. Army Corps of Engineers, Office of History, (1993).
- Bragdon, Henry W., McCutchen, Samuel P., and Cole, Charles W., *A History of a Free People*. New York NY: Macmillan Publishing Co., Inc., (1973).
- Brigham, Eugene F., and Ehrhardt, Michael C., *Financial Management: Theory and Practice with Cards*, (2007).
- Buddin, Richard J., Grezenz, Carole Roan, Hosek, Susan D., Elliott, Marc N., and Hawes-Dawson, Jennifer, *An Evaluation of Housing Options for Military Families*. Santa Monica CA: RAND, (2001).
- Congressional Budget Office (CBO). Historical budget data available on line:
<http://www.cbo.gov>, (October 2008).
- Dalton, Michael G., District Manager Military Housing, The Properties at Wright Field. Personal interview, (18 August 2008).
- Defense Science Board, Office of the Under Secretary of Defense for Acquisition and Technology, Department of Defense, Task Force on Quality of Life Final Report. Washington DC, (1995).
- Department of Defense. *Family Housing*. Defense Management Report Decision (DMRD) #966, Washington DC, (October 1990).
- DTIC, Official Basic Allowance of Housing Rates Query. Available on line:
<http://perdiem.hqda.pentagon.mil/perdiem/>, 2009.
- Federal Reserve Treasury Inflation-Indexed Bond data is available on line:
<http://research.stlouisfed.org/fred2/series/TP30A28>, (2009).
- General Accounting Office (GAO), Military Housing: Continued Concerns In Implementing the Privatization Initiative, (NSIAD-00-71: Washington DC: Author. March 2000).

- Halachmi, Ariel and Boydston, Robert., *The Political Economy of Outsourcing*. Tennessee State University, Nashville, Tennessee, (n.d.).
- Hartman, C., and Drayer, R., A Research Note: *Military-Family Housing: The Other Public Housing Program*. *House and Society* 17, (1990).
- Heil, Patti, SAF/FMBIC. Personal Interview (26 Jan 2009).
- Hershfield, D.C., *Attacking Housing Discrimination: Economic Power of the Military in Desegregating Off-base Rental Housing*. *American Journal of Economics and Sociology*, (January 1985).
- Hoffman, Tracy Diane and Worcester, James Alan, *Navy Family Housing: A study of Adequacy Standards and their Relationship to their Relationship to the Variable Housing Allowance*. Master's Thesis, Naval Post Graduate School, Monterey, California (June 1991).
- House Committee on Armed Services, Subcommittee on Wherry Acquisition, *Acquisition of Wherry Housing Projects: Hearings on Sundry Legislation Affecting the Naval and Military Establishments*, 86th Cong., 1st sess., (1959).
- Kokocha, Lawrence P., *An Evaluation of Public and Private Sector Housing Alternatives for Military Families*. Master's thesis, Air Force Institute of Technology, Air University, (March 2002).
- Office of the Assistant Secretary of Defense (Personnel and Readiness (OASDR&P), *Family Status and Initial Term of Service*, Volume II – Trends and Indicators. (Washington DC: Author, 1993).
- Office of the Deputy Under Secretary of Defense Installations and Environment (OUSDIE). Available on line: <http://www.acq.osd.mil/housing/>, (February 2009).
- Mamaux, Harry, AF/A7CAH. Personal Interview (12 December 2008).
- Milican, J.R. *Housing Our People*. *Engineering & Services Quarterly*, Winter (1983).
- Military Housing Privatization Initiative, Program Evaluation Plan (PEP) project summary report: Hill, Buckley, Robins, Lackland, Wright-Patterson, Elmendorf, Nellis, and Dover AFBs, (30 June 2008).
- Morrison, Philip D., *State Property Tax Implications for Military Privatized family Housing Program*. *Air Force Law Review*, (2005).
- Nalder, Eric., *America's Military Housing Disaster: A Whistle-Blower Awaits Vindication*. *Seattle Post*, (7 August 2008).

- National Defense Authorization Act (NDAA) fiscal year 1998. Available on line:
<http://www.dod.mil/dodgc/olc/docs/1998NDAA.pdf>, (18 November 1997).
- Ray Michael T., *The Operation of Military Family Housing As a Business Enterprise A Case Study at Langley AFB, Virginia*. Master's Thesis, Air Force Institute of Technology, Air University, (September 1991).
- Saylor publication data available on line: <http://www.saylor.com/lacosts/> (2009).
- Shassberger, John E., *An Analysis of Implementing a Rental Policy Within the DoD's Military Family Housing Program*. Master's Thesis, Naval Post Graduate School, (June 1994)
- Taylor, Michael R., Executive Director National Demolition Association. Personal Interview. 21 January 2009
- Twiss, Pamela C., and Martin, James A., *Quality of Life and Shelter: A History of Military Housing Policy and initiatives (1973-1996)*. Scranton PA: Military Family Institute Marywood University, (1998).
- U.S. Census housing data available on line:
<http://www.census.gov/hhes/www/housing/ahs/ahs01/tab1a3.html> (2001).
- Yancy, Al. Historical information provided from an updated paper., *History-Navy Family Housing*. HQ USAF/CEH, Washington DC, (June 1991).

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14. ABSTRACT To solve the latest housing short fall, the government approved the Military Housing Privatization Initiative (MHPI) 1996. Under this program the government contracts private developers to build, own, and operate housing units. The developer then collects rent via housing allowance. At the time MHPI was approved, military members were expected to pay 15 percent of their housing costs out of pocket. Subsequent legislation has increased housing allowance to provide 100 percent of all housing costs eliminating out of pocket housing expense. Given the increased housing allowance, the objective of this research was to determine if there is financial value to the government to retain ownership of military family housing. This was done by calculating the Net Present Value (NPV) of recapitalizing BAH payments into family housing operations over 50 years, the contract period for privatized housing projects. The results show that MHPI provided the greatest financial benefit to the government at the time it was signed into law. This advantage changed when housing allowance increased eliminating out of pocket housing expense to the military member.					
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